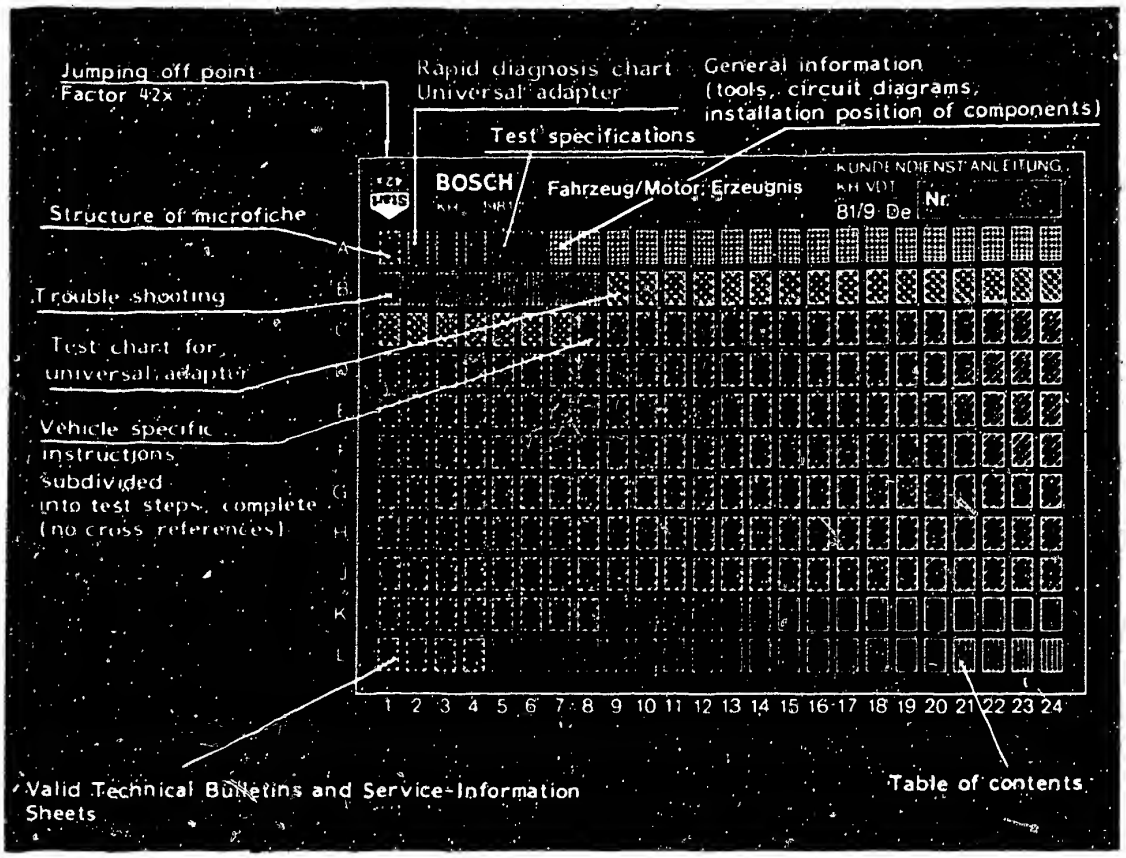


1. Read from left to right

2. Title of microfiche (appears on each coordinate)

E16	Product/assembly/test step	
	Vehicle/engine	

Coordinate

3. Limits of section

Beginning | Mid-section | End | One-page section

4. Purely vehicle-related passages identified by a vertical bar.

5. References to relevant test steps in test specifications; coordinate e.g. C6

C6

A1 Trouble-shooting program

Rapid diagnosis chart for L-Jetronic universal adapter

The following rapid diagnosis chart makes it possible for the experienced L-Jetronic expert to quickly check the electrical part of the system using the L-Jetronic universal adapter.

The rapid diagnosis chart contains the following information:

- Switch positions on universal adapter
- Sequence of test steps
- Notes on how to operate the universal adapter or other components
- Readings on the multimeter
- References to coordinates of the relevant detailed testing and trouble-shooting program.

If detailed information and instructions are necessary, always proceed according to the trouble-shooting program starting on Coordinate B 1/B 2.

Rapid diagnosis chart for L-Jetronic universal adapter

Test step	Switch position V	Switch position Ω	Remarks	Test specifications (reading)	See Coordinate for trouble-shooting
1	5	-	Shift gear to neutral. Operate starting motor. Measure voltage pulses with motortester.	Ignition pulses on motortester (greater than 80 V)	B 10
2	6	-	Shift gear to neutral. Operate starting motor. Measure voltage.	8 ... 15 V	B 12
3	7	-	Shift gear to neutral. Operate starting motor. Measure voltage.	8 ... 15 V	B 14
4	↓	11	Measure resistance.	100 Ω ... 200 Ω	B 16
5	↓	12	Deflect air-flow sensor flap. Measure resistance.	60 Ω ... 1000 Ω	B 19
6	↓	13	Measure resistance.	30 Ω ... 30 kΩ (depends on temperature)	B 21
7	↓	14	Measure resistance.	0...10Ω	B 23
8	↓	16	Accelerator in rest position. Measure resistance.	0...10Ω	C 1
9	↓	17	Accelerator in full-load position. Measure resistance.	0...10Ω	C 3
10	↓	19	Measure resistance.	+ 20°C: 7.00...9.50Ω + 80°C: 7.20...10.00Ω	C 5

B7

Idle speed 2.0 E engine

Manually-shifted transmission	850...900 min^{-1}
Automatic transmission (selector lever in position P)	850...900 min^{-1}

Exhaust-gas setting

CO concentration with engine at normal operating temperature	max. 1 % by vol.

Fuel pressure

Europe:	2.3...2.7 bar
Sweden:	2.8...3.2 bar

Fuel pump delivery	min. 700 cm^3/30s

Solenoid-operated injection valve:

Electrical internal resistance at +20°C:	15.0...17.5Ω

B5

Auxiliary-air device:

Electrical internal resistance	35...70Ω

B7

Temperature sensor II (water)

Electrical internal resistance at ambient temperature (+15°C...30°C):	1.45...3.3 kΩ
with engine at operating temperature (approx. 80°C) :	280 ...360 Ω

B7

Thermo-time switch
Electrical internal resistance:

	Between Term."G" and ground	Between Term."W"and ground	Between Term Term."G" and "W"
Ambient temperature (below 30°C)	25...40 Ω	0 Ω	25...40 Ω
Engine temperature (above 40°C)	50...80 Ω	100...160 Ω	50...80 Ω

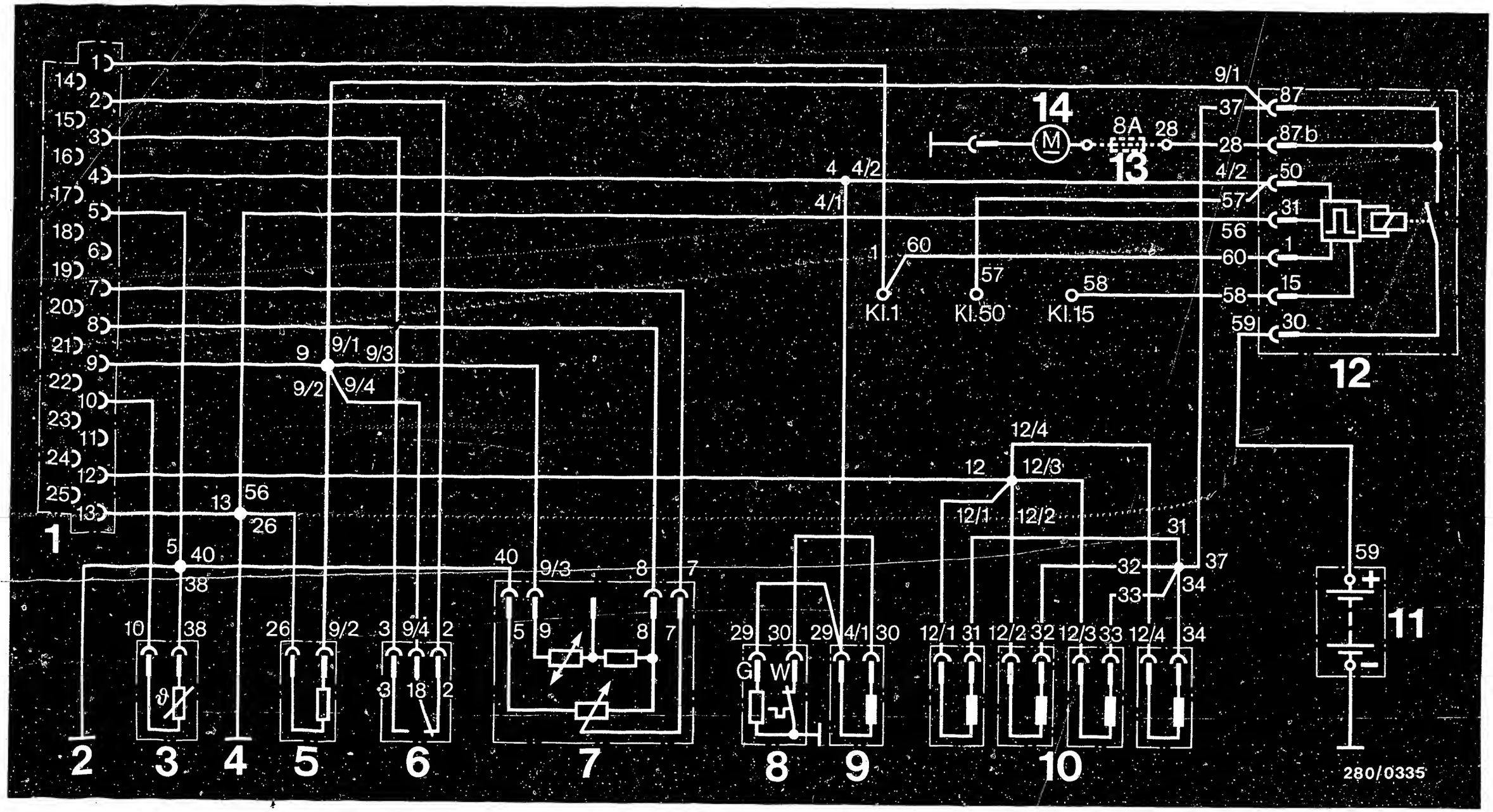
B5

Air-flow sensor

Resistance between:

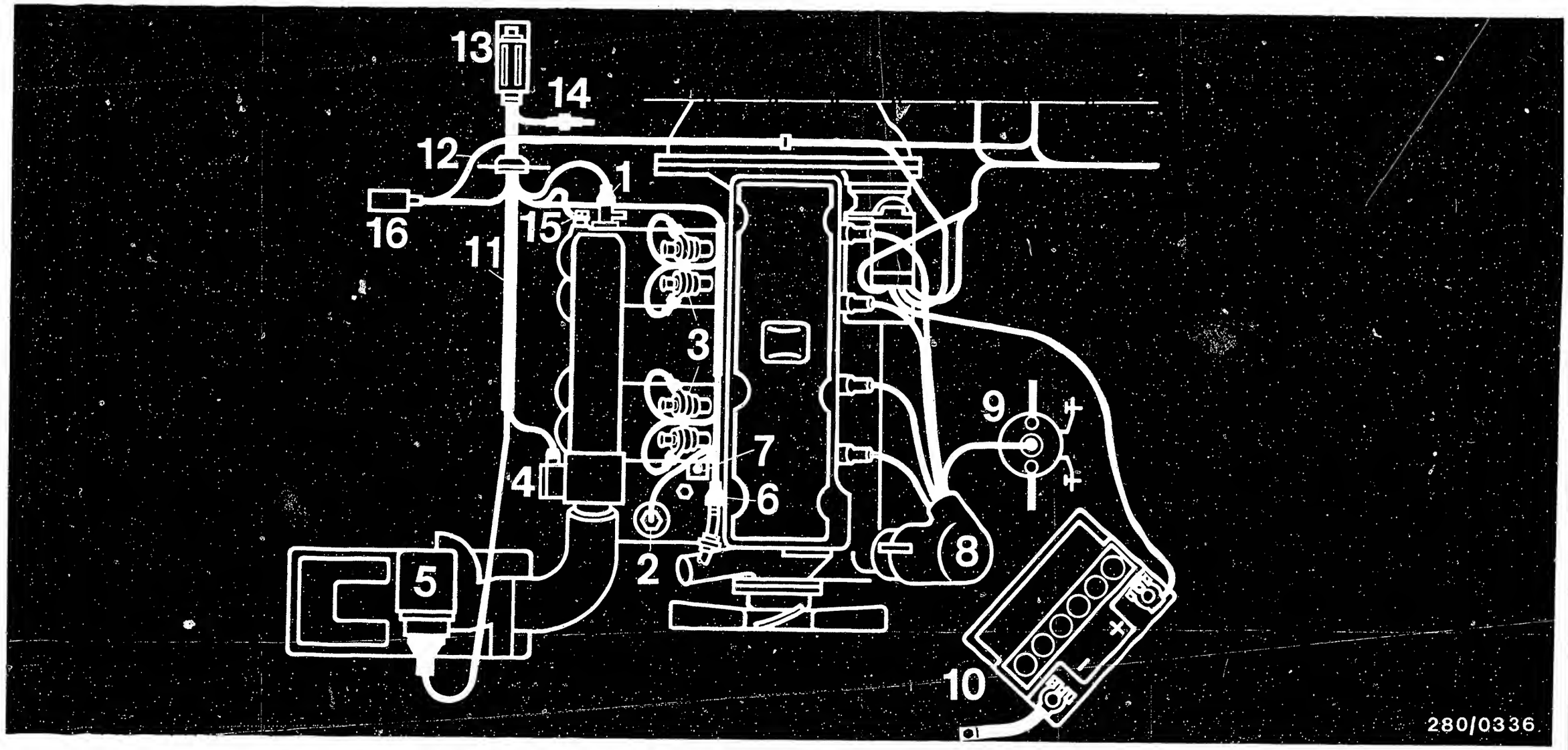
Term. 8 and term. 5	340	...450 Ω
Term. 7 and term. 5	60	..1000 Ω
Term. 8 and term. 9	160	...300 Ω
Term. 9 and term. 5	500	...760 Ω

See equipment and Autodata microfiches for settings for ignition, valve clearance and other engine data.



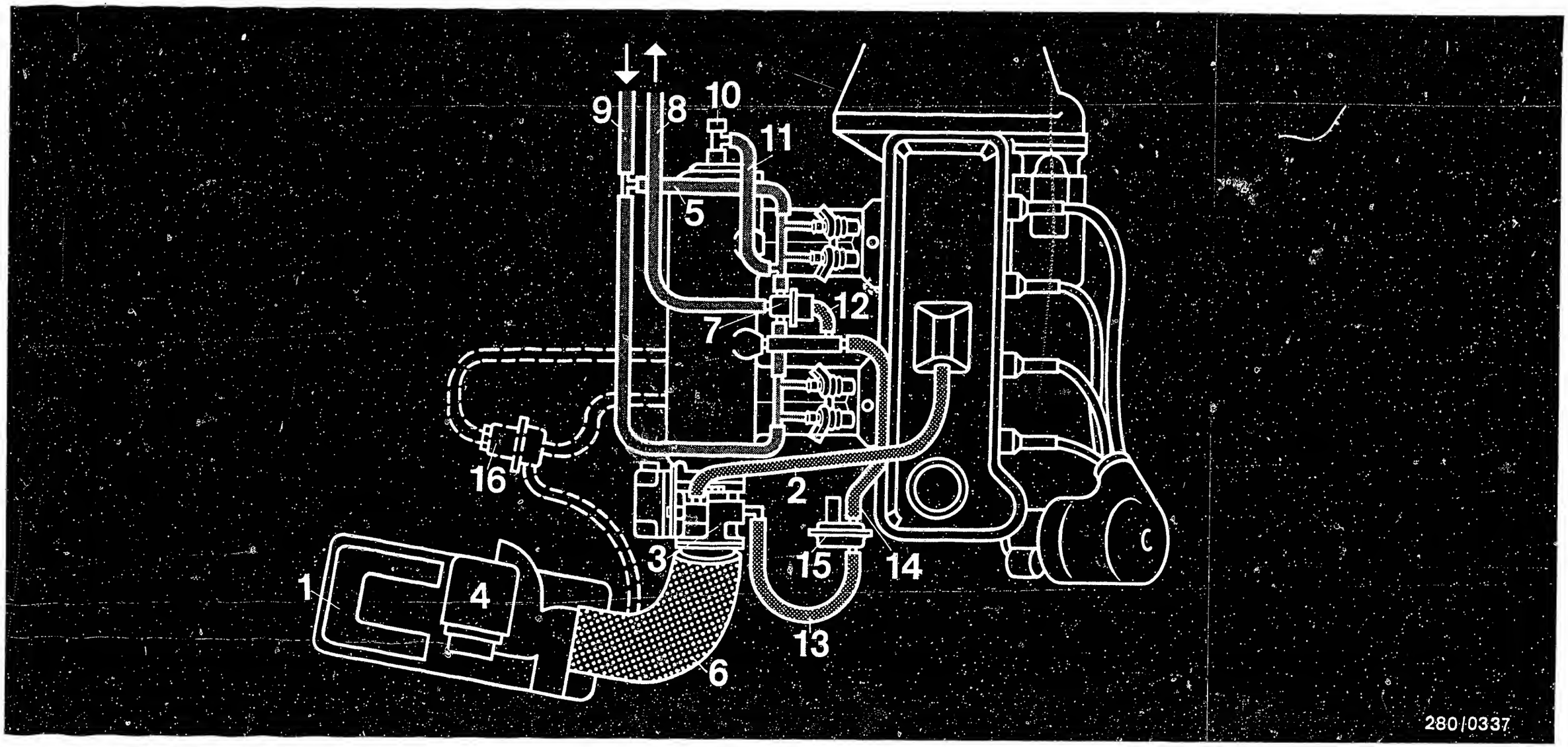
Electrical terminal diagram of LE-Jetronic

1 = Multiple plug
2 = Ground terminal (electronics)
3 = Temperature sensor (engine)
4 = Output stage ground terminal
5 = Auxiliary-air device
6 = Throttle-valve switch
7 = Air-flow sensor
8 = Thermo-time switch
9 = Start valve
10 = Solenoid-op. injection valves
11 = Battery
12 = Control relay
13 = Fuel pump fuse
14 = Electric fuel pump



Electrical wiring diagram of LE-Jetronic and arrangement of individual components

1 = Start valve
2 = Thermo-time switch
3 = Solenoid-op. injection valves
4 = Throttle-valve switch
5 = Air-flow sensor
6 = Auxiliary-air device
7 = Temperature sensor II
8 = Ignition distributor
9 = Ignition coil
10 = Battery
11 = Jetronic wiring harness
12 = Vehicle wiring harness
13 = Control unit
14 = Plug-in connection term. 1
15 = Central ground
16 = Control relay



Air and fuel hoses in engine compartment

Air

Fuel

1 = Air filter
2 = Engine forced ventilation
3 = Throttle-valve assembly
4 = Air-flow sensor
5 = Fuel delivery line (ring main)
6 = Air hose (from air-flow sensor to throttle-valve assembly)
7 = Pressure regulator
8 = Fuel return line
9 = Fuel delivery line
10 = Start valve
11 = Fuel delivery line to start valve
12 = Vacuum line (from pressure regulator to intake manifold)
13 = Hose (from throttle-valve assembly to auxiliary-air device)
14 = Hose (from auxiliary-air device to intake manifold)
15 = Auxiliary-air device
16 = Vacuum limiter (Sweden only)

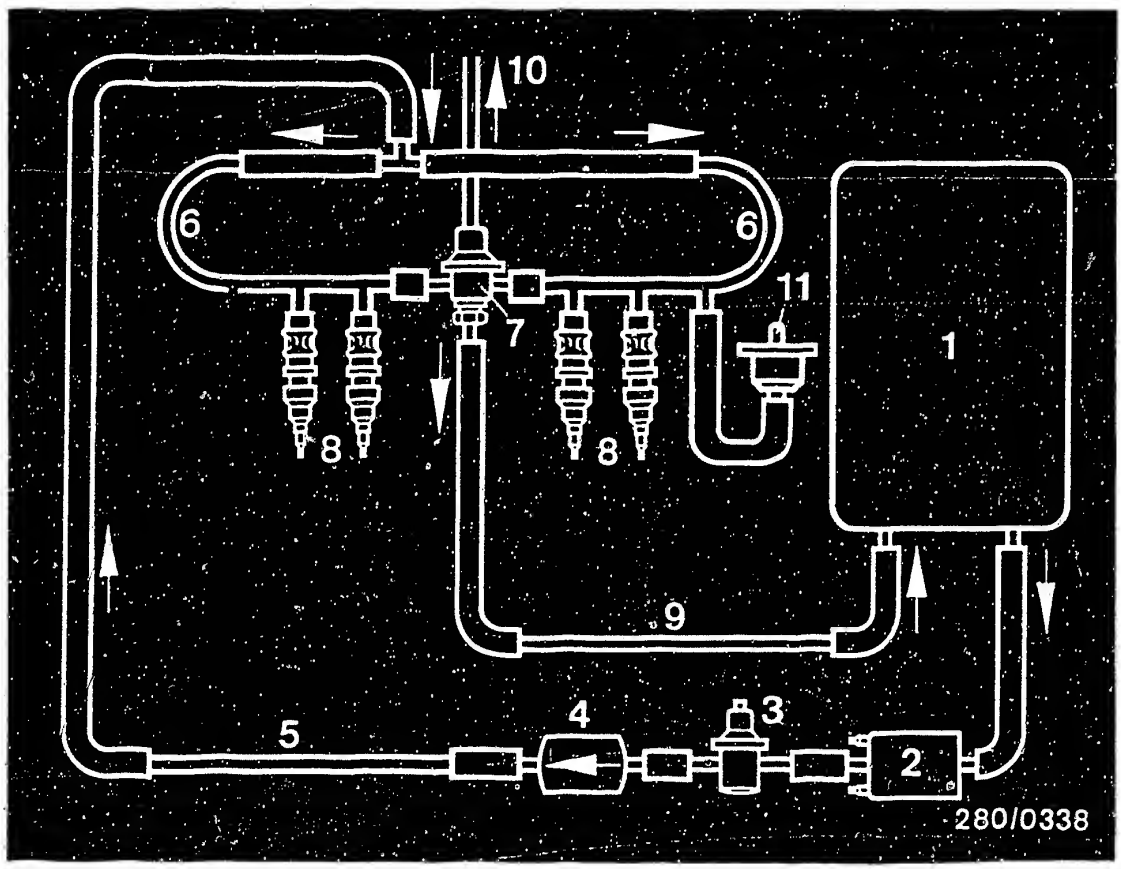


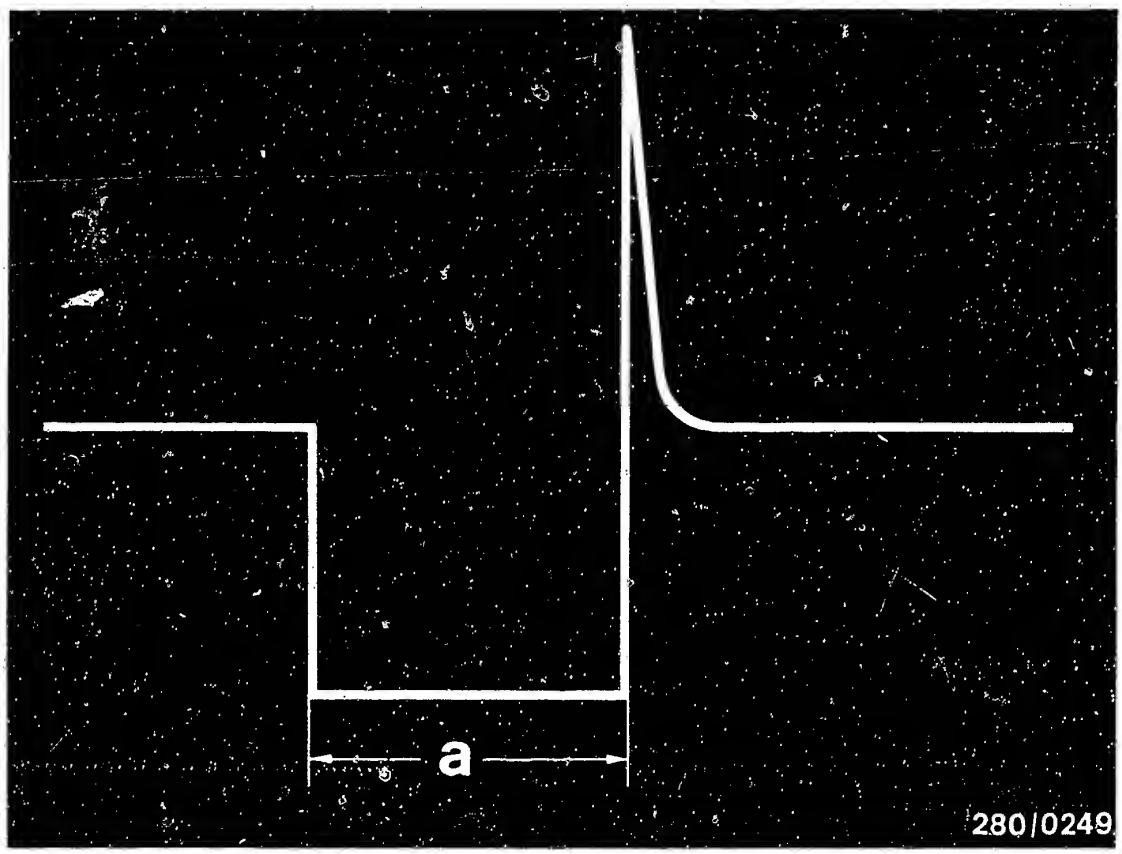
Diagram of fuel lines

1 = Fuel tank
2 = Electric fuel pump
3 = Fuel-line-pressure damper
4 = Fuel filter
5 = Fuel delivery line
6 = Fuel ring main
7 = Pressure regulator
8 = Solenoid-operated injection valves
9 = Fuel return line
10 = Connection to intake manifold
11 = Start valve

Test equipment and tools

Universal adapter	ETT 018.01	0 684 001 801
Adapter lead		1 684 463 123
Motortester	e.g. MOT 002.00	0 684 000 200
	MOT 300	0 684 000 300
	MOT 400	0 684 000 400
Test lead		1 684 463 093
Exhaust-gas analyzer calibrated:	e.g. ETT 008.04	0 684 100 804
	ETT 008.05	0 684 100 805
not calibrated:	e.g. ETT 008.00	0 684 100 800
Pressure gauge	quality class 1.0 = 6 bar 0.1 bar graduations	1 687 231 154
Three-way line Pressure tester		KDJE P-100/13 KDJE-P 100
or Pressure tester (no longer available)		KDEP 1034
Clamping fixture		1 688 120 093
Assembly mandrel		1 687 931 003
Electrics tester	e.g. ETE 014.00	0 684 101 400
	MMD 301	0 684 500 301
or multi-range meter	e.g. Fa. Philips	PM 2517 X
	Fa. Miselco	Master 50 K
	Fa. Fluke	Multimeter 75 or 77
Solenoid-operated injection valve		0 280 150 205

Tool set for fitting and removing the idle CO anti-tamper device on the air-flow senor use suitable, commercially available tools.



a = Length of regulation (dependent on the engine load)

Test lead

Using the test lead, the injection pulses at the injection valves can be tested with an ignition oscilloscope with the engine running.
The illustration shows the injection pulse of a switched output stage, measured at the solenoid-operated injection valve.

Caution:
Connect only one terminal of the test lead to the special input on the motortester. When the correct test terminal is connected, the above-shown voltage curve will be visible on the injection oscilloscope.

Instructions on use of universal adapter with adapter lead for LE-Jetronic

General:

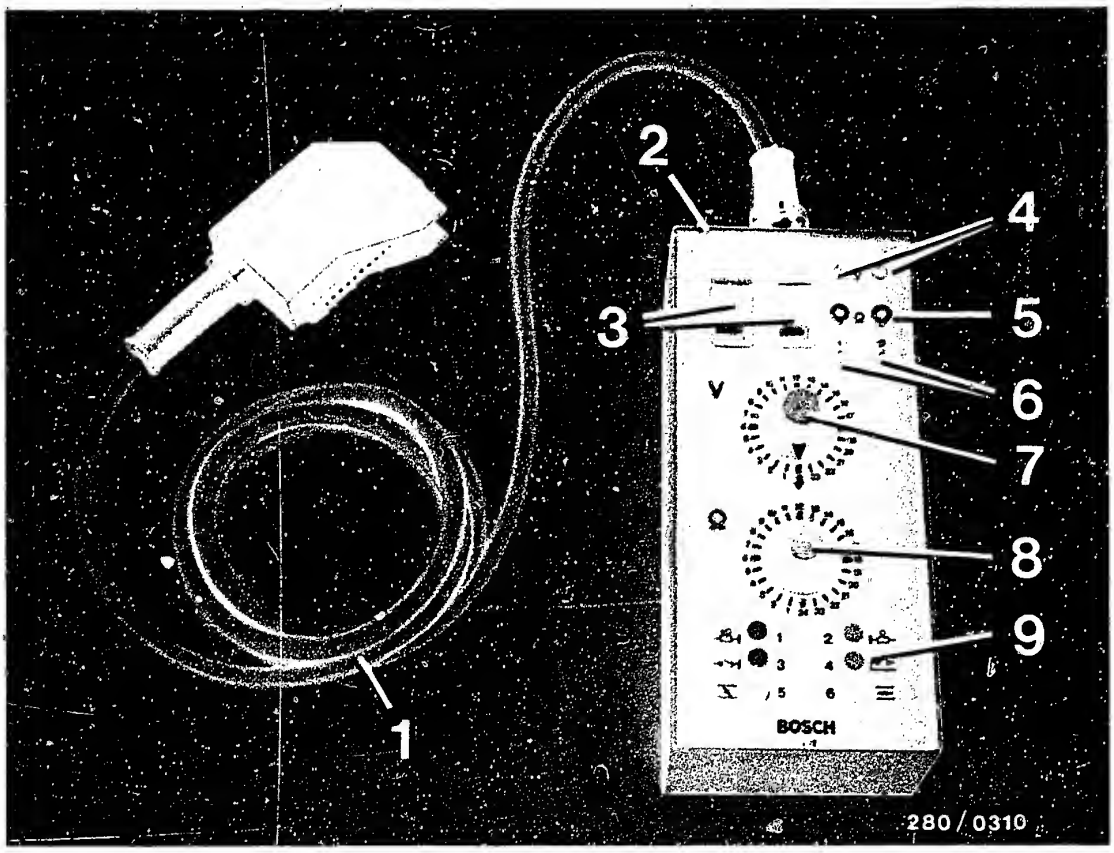
The universal adapter is plugged onto the vehicle wiring harness with the adapter lead.

Caution:

Connect and disconnect the universal adapter only with the ignition switched off!

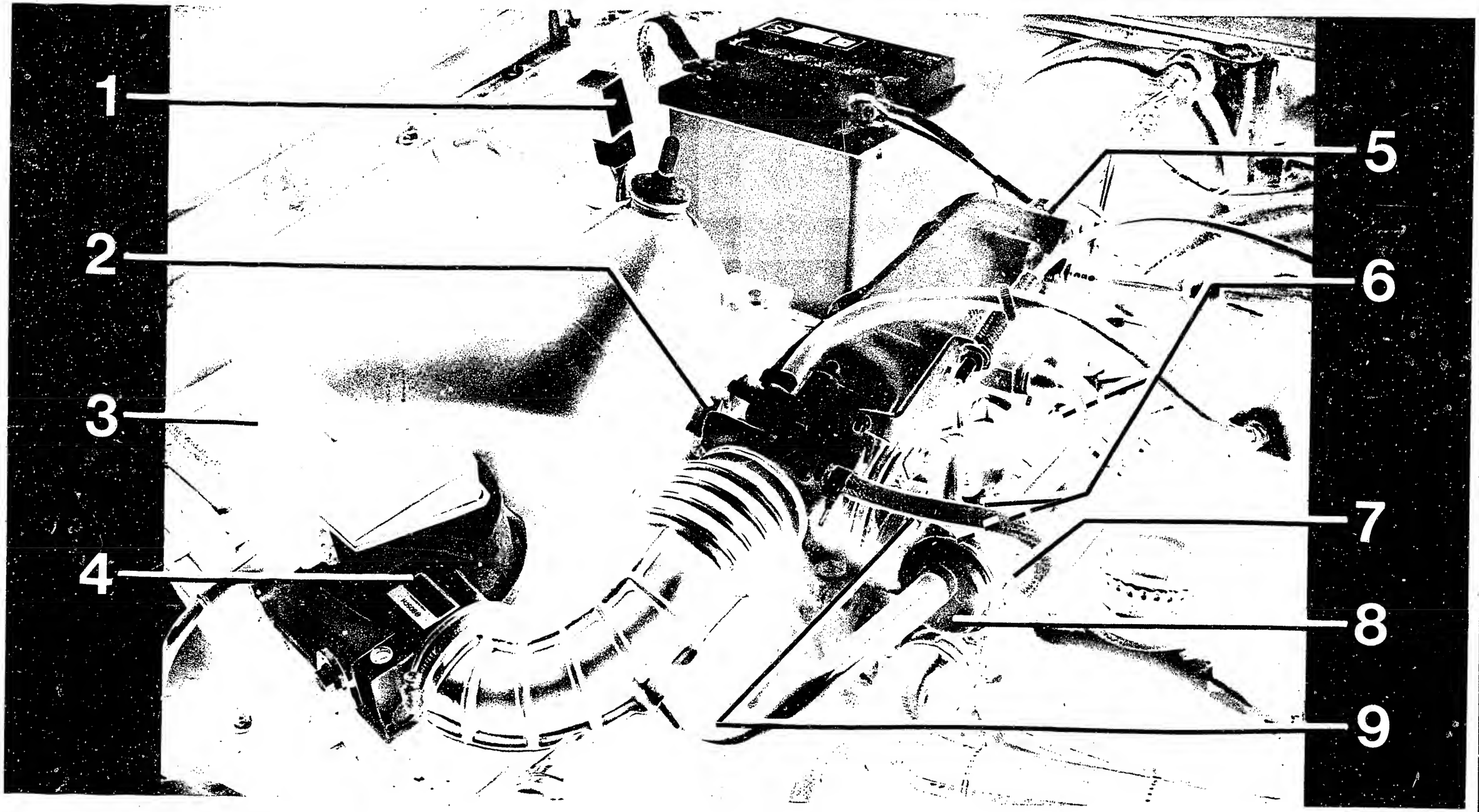
Testing:

For testing, connect a multimeter with R_i min. 20 kΩ/V to the test adapter.
In addition, the signal from term. 1 of the ignition coil can be measured with a motortester via the special input.



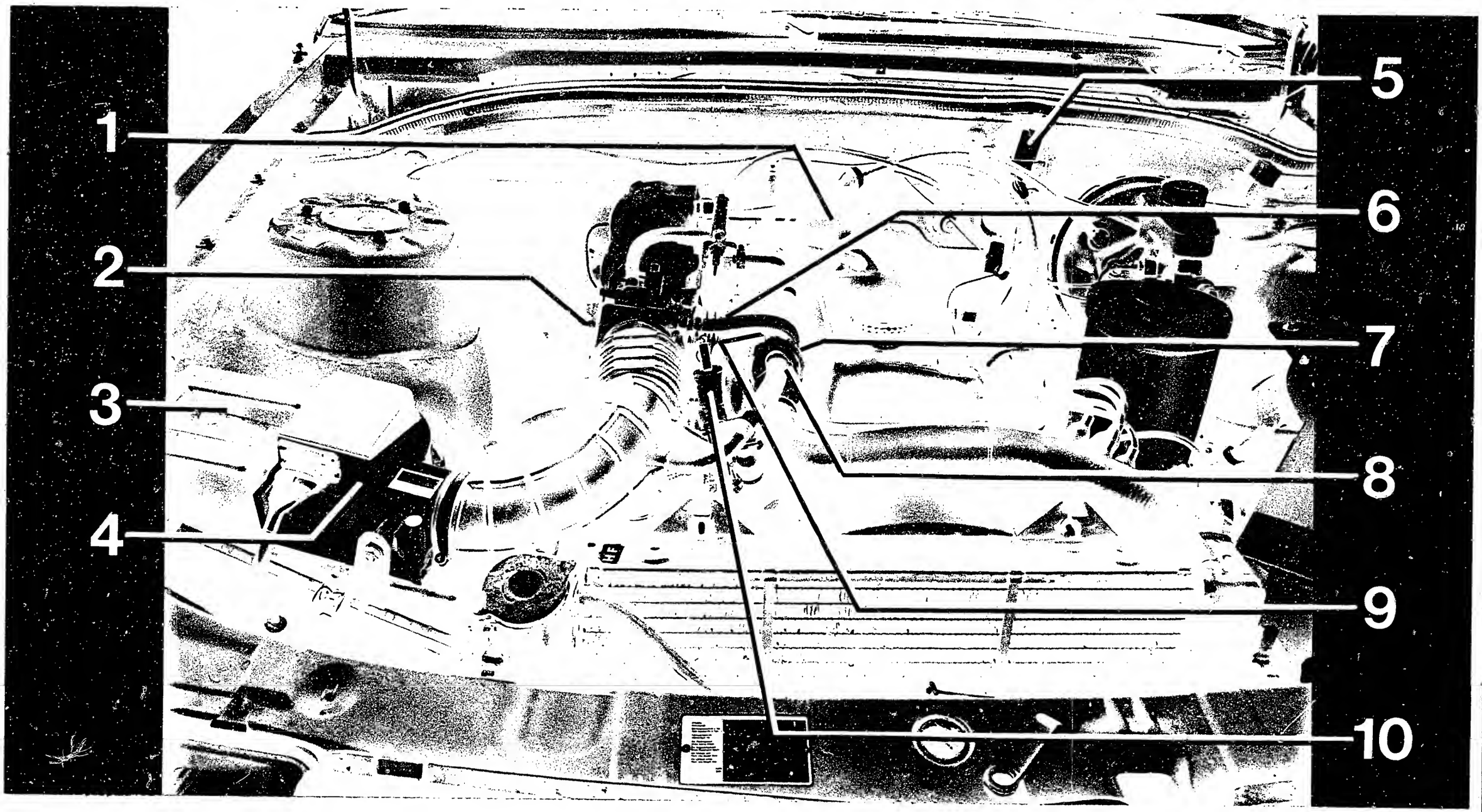
Universal adapter with adapter lead for 2nd generation L-Jetronic

1 = Adapter lead (Part No.: 1 684 463 123)
2 = Universal adapter (Part No.: 0 684 001 801)
3 = Test wells (for motortester)
4 = Test sockets (for voltage measurement)
5 = Test sockets (for resistance measurement)
6 = Test sockets (not yet occupied)
7 = Program switch "volt"
8 = Program switch "ohm"
9 = Button panel (not occupied for LE-Jetronic)



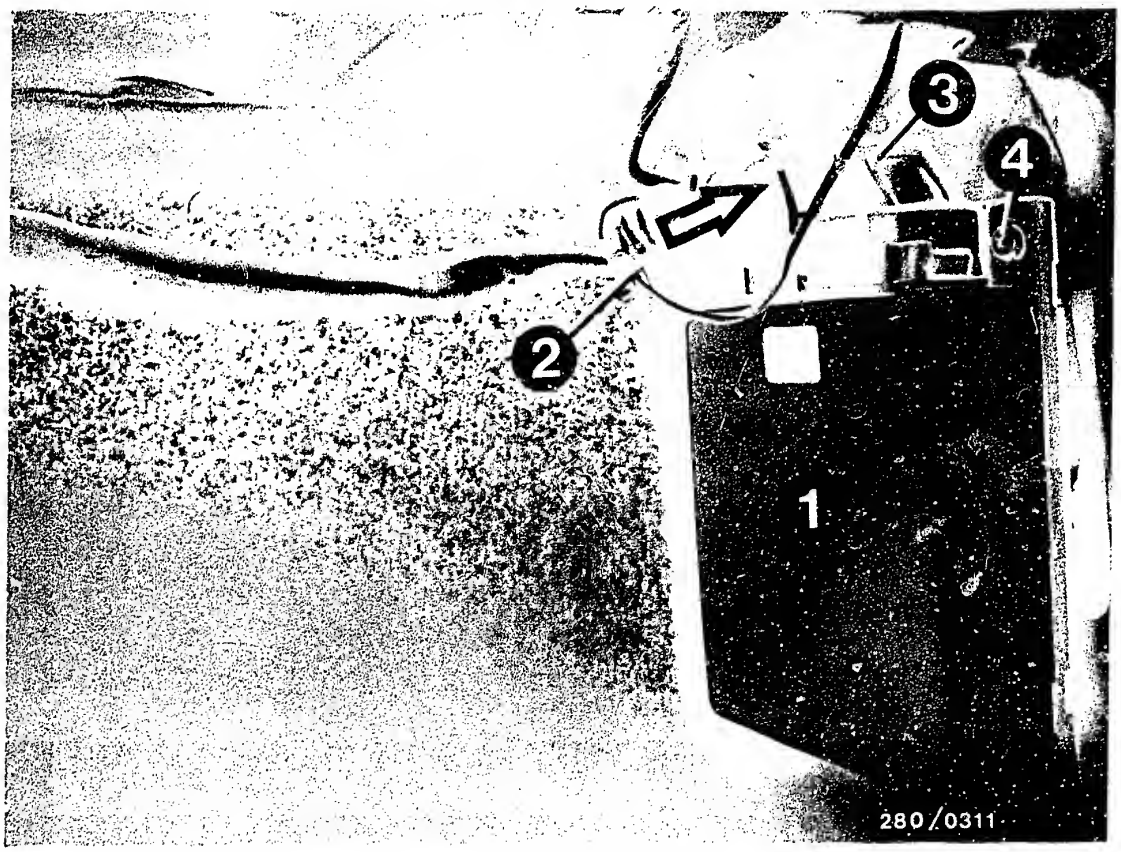
Installation position of components (Opel Manta 2.0 l)

1 = Control relay
2 = Throttle-valve switch
3 = Air filter
4 = Air-flow sensor
5 = Start valve
6 = Solenoid-op. injection valves
7 = Temperature sensor II (white plug)
8 = Auxiliary-air device
9 = Thermo-time switch (brown plug)



Installation position of components (Opel Rekord 2.0 l)

1 = Start valve
2 = Throttle-valve switch
3 = Air filter
4 = Air-flow sensor
5 = Control relay
6 = Solenoid-op. injection valves
7 = Temperature sensor II (white plug)
8 = Auxiliary-air device
9 = Thermo-time switch (brown plug)
10 = Solenoid-op. air valve (only with air conditioner)



1 = Control unit
2 = Plug-in connection term. 1
3 = To connect the test adapter, remove multiple plug (25-pin). To do this, press the detent in the direction of the arrow.
4 = Fastening screws

Installation position of remaining components

The indications "right" and "left" apply when viewed from behind the vehicle.

Control unit

The control unit is located in the passenger compartment on the front passenger side in the footwell at the bottom right.

Pressure regulator:	underneath intake manifold center right
Fuel-line-pressure damper:	underneath vehicle, on right-hand side behind rear wheel
Fuel filter:	underneath vehicle, on right-hand side in front of rear wheel
Fuel pump:	underneath vehicle, on right-hand side behind rear wheel
Pump fuse:	in fuse box, driver's side, underneath instrument panel on left-hand side
Temperature sensor II:	in cooling water circuit at front on engine block
Central ground:	on intake manifold on right-hand side rear firewall
Vacuum limiter: (only on Sweden version)	near throttle-valve assembly

Important general information

1. Never start engine without securely connected battery.
2. Do not use a starting aid with more than 16 V or a fast charger for starting.
3. Never disconnect battery from vehicle electrical system with engine running.
4. Disconnect battery from vehicle electrical system when fast charging.
5. Remove control unit at temperatures above 80°C (paint drying installation).
6. Ensure that all connectors of wiring harness are properly attached.
7. Never connect or disconnect wiring-harness plug of control unit with ignition switched on.
8. When testing compression, cut the power supply by removing the control relay. This ensures that the voltage supply for the LE-Jetronic and therefore also the injection valves is interrupted. Undesired injecting is thus prevented.
9. Remove the LE-Jetronic control unit before carrying out electric welding work (e.g. spot welding).
10. When using the following trouble-shooting program it is assumed that the engine is in proper working order and that the ignition is correctly set. The electrical system must be checked and, if necessary, repaired.

In order to carry out the testing operations described in this manual and in order to assess the components, you should be familiar with the L-Jetronic and how it works. The essential points regarding the operation and construction of the L-Jetronic are described in Technical Instruction VDT-U3/3.

Trouble-shooting

The following trouble-shooting programs are designed to enable workshop employees, using the universal adapter with adapter lead (1 684 463 123) and other suitable test equipment, to quickly locate causes of trouble on the L-Jetronic.
Depending on the level of knowledge and experience of the mechanic, a choice can be made between the following procedures:

- detailed step-by-step trouble-shooting for employees with little experience or practice on LE-Jetronic vehicles **B3**

- pin-pointed direct trouble-shooting for trained, experienced employees who have had a great deal of practice on LE-Jetronic vehicles **B5**

Both trouble-shooting programs begin by checking the electrical part of the LE-Jetronic with the aid of the universal adapter with adapter lead. In this way, the wiring harness with the connected components is soon checked for proper electrical operation and faults are quickly located.
If no fault is found using the universal adapter with adapter lead, continue trouble-shooting with the detailed or the direct trouble-shooting program.

1. Detailed step-by-step trouble-shooting

1.1 Test with universal adapter with adapter lead 1 684 463 123

This test must come at the beginning of the test program and must be performed from beginning to end (Coordinates B 9 - C 7).

1.2 Trouble-shooting according to customer complaints (symptoms of trouble)

The table below contains possible symptoms of trouble and gives the first coordinate of the relevant detailed trouble-shooting program in the column on the right.
The trouble-shooting program consists of logically ordered test procedures for all individual components of the LE-Jetronic. If, after completing the trouble-shooting program for an assumed trouble, the fault has not been detected or remedied, take a new symptom of the trouble and work through another program.

Customer complaint (symptom of trouble)	Universal adapter	Coordinate
1. Engine fails to start or starts only with great difficulty	B 9	C 8
2. Engine starts but then dies	B 9	D 11
3. Uneven engine idle	B 9	E 7
4. Poor throttle take-up	B 9	F 13
5. Engine misses under all operating conditions	B 9	G 3
6. Fuel consumption too high	B 9	G 19
7. No maximum engine power	B 9	H 17
8. CO concentration at idle too high or too low	B 9	J 13

2. Pin-pointed direct trouble-shooting

2.1 Test with universal adapter with adapter lead 1 684 463 123

The test with the universal adapter must come at the beginning of the test program and must be performed from beginning to end (see Coordinates B 9 - C 7).

2.2 Trouble-shooting according to customer complaints

The table below contains various symptoms of trouble with several possible causes of the trouble in each case. The Coordinate reference field indicates the first coordinate of the test procedure for the respective LE-Jetronic components. If, after testing the individual components, the fault has not been detected or remedied, choose a new symptom of the trouble.

Customer complaint (symptom of trouble)

1. Engine fails to start or starts only with great difficulty	2. Engine starts but then dies	3. Uneven engine idle, idle speed incorrect	4. Poor throttle take-up	5. Engine missing under all operating conditions	6. Fuel consumption too high	7. No maximum engine power	8. CO concentration at idle too high or too low	Cause (component fault)
B 9	B 9	B 9	B 9	B 9	B 9	B 9	B 9	Universal adapter
C10				G 5				Control relay defective
C10								Electric fuel pump not operating
D 3	E 1		F17					Auxiliary-air device not opening
		E13						Auxiliary-air device not closing
D 5		F 5	F19	G 9	G 9	J 7	J17	Air-flow sensor defective
		F 3		G13				Vacuum limiter defective (on Sweden version only)

Continued on B 7 / B 8

Customer complaint (symptom of trouble)

1. Engine fails to start or starts only with great difficulty	2. Engine starts but then dies	3. Uneven engine idle, idle speed incorrect	4. Poor throttle take-up	5. Engine missing under all operating conditions	6. Fuel consumption too high	7. No maximum engine power	8. CO concentration at idle too high or too low	Cause (component fault)
C22		E15						Start valve not opening
D 1	D23	E17			H 7		K 5	Start valve leaking
D 1		E17						Thermo-time switch defective
D 7	E 3	F 7	F21			J 9	K 7	Air-intake system leaking
		F 5		G17	H 7			Solenoid-operated injection valves defective
C12	D13	E19				H19	J17	Fuel pressure too low or zero; pressure regulator not operating
					G21		J17	Fuel pressure too high; pressure regulator not operating
				G11		J 5		Fuel delivery too low
					H 9		K 3	Temperature sensor II in engine defective
		E 9	F15	G15				Throttle valve not closing
						H19		Throttle valve not opening fully
				G 5				Poor central ground, loose contacts, faulty plug-in connections
D 7	E 3	F 7	F21			J 9	K 7	Open circuit in wiring harness and plug-in connections
						H19		Throttle-valve switch defective
		F 9	F23		H12		J15	CO exhaust-gas setting too rich, idle adjustment
		F 9	F23	G17			J15	CO exhaust-gas setting too lean, idle adjustment
				G11				Control unit defective

Test chart for universal adapter with adapter lead connected - LE-Jetronic

Test chart for Opel Rekord and Manta as of 10.81

Carefully plug the universal adapter onto the vehicle wiring harness (ignition must be off).
The universal adapter is used for testing the peripherals only. In order to obtain the measured values, connect to the universal adapter e.g.a multimeter for voltage and resistance measurements as well as a motortester.
The individual test steps are selected by means of two program switches (one for voltage measurements, the other for resistance measurements). Each program switch has 24 test positions, only some of which are occupied for the LE-Jetronic.
Be sure to observe the instructions given in the test chart!

In test steps 1-3, voltages are measured while starting.
Caution: Set the multimeter to "voltage measuring range"

In test steps 4-10, resistances are measured.
Caution: Set the multimeter to "resistance measuring range".

Test specifications and operator information for the universal adapter are given in the following test chart.
The control unit is located in the passenger compartment on the front passenger side in the footwell at the bottom right. It is fastened in position by three screws.

Note:
In the following test steps a white surround in the "Operation" column indicates which operation is different from the preceding test step.

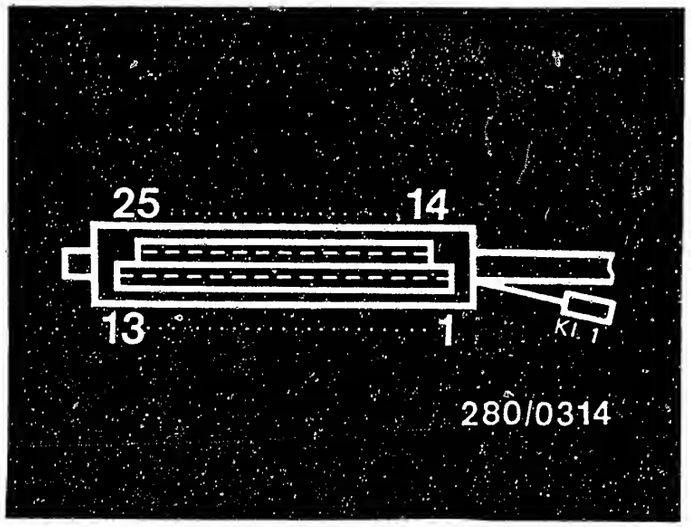
Test step: 1

Operation		Reading	Testing
Program switch position "V"	5	Ignition oscilloscope must indicate ignition pulses	Component: Signal from term. 1
Program switch position "Ω":	1) -		Operation: Triggering of control unit by the ignition
Measuring equipment: Motortester			Malfunction: No reading
Measuring range: Special input . Control stick up against left-hand stop and measuring range 20V			
Connection: Testwells		Trouble-shooting: For testing, remove the wiring-harness plug from the test adapter and use the circuit diagram if necessary.	
Operation in vehicle: Ignition "ON" and operate starting motor		Test the following leads for continuity using ohmmeter (set value 0 Ω):	

From multiple plug term. 1 to ignition coil term. 1
From multiple plug term. 5 to electronics ground terminal.

Eliminate contact resistances in the plug-in connections.

1) Switch position not specified.



Kl. = Terminal

Top view of multiple plug

Installation position of components

1. Electronics ground terminal:
On intake manifold on right-hand side near firewall

Test step: 2

Operation		Reading	Testing
Program switch position "V"	6	Multimeter must indicate 8 ... 15 V	Component: Control relay, voltage supply
Program switch position "Ω":	-		Operation: Voltage supply
Measuring equipment: Multimeter (volt range)			Malfunction: No voltage reading
Measuring range: 0...15 V			
Connection: Test sockets red (positive) and black			
Operation in vehicle: Ignition "ON" and operate starting motor			

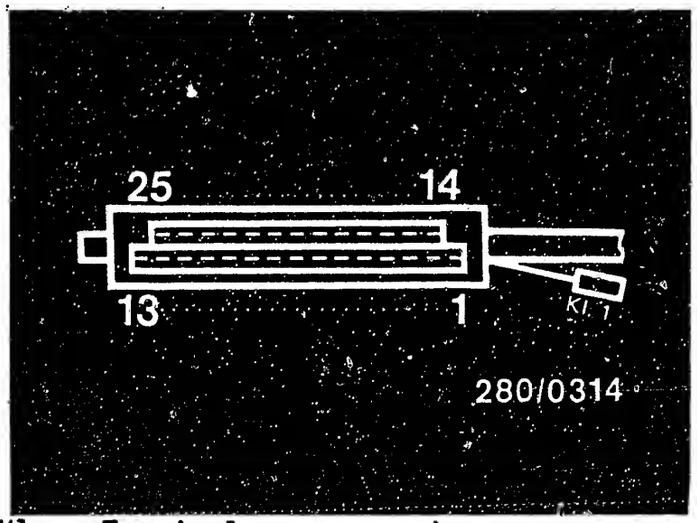
Trouble-shooting:
For testing, remove the wiring-harness plug from the test adapter and use the circuit diagram if necessary.

Test the following leads for continuity using ohmmeter (set value: approx. 0 Ω):

From multiple plug term. 9 to control relay term. 87
From control relay term. 30 to battery (positive terminal)
Warning! disconnect battery!
From multiple plug term. 5 to electronics ground terminal

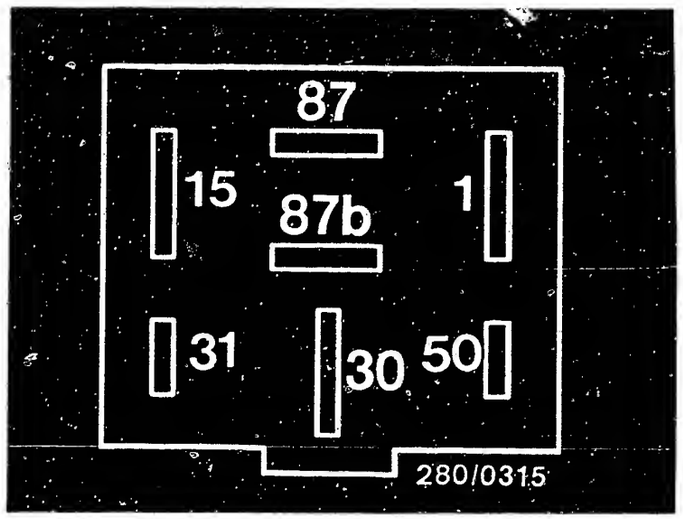
Eliminate contact resistances at the plug-in connections.

Installation position of components:
1. Control relay: In engine compartment on right-hand side near firewall
2. Electronics ground terminal: On intake manifold on right-hand side near firewall



Kl. = Terminal

Top view of multiple plug



Control relay
(top view of connection base)

Test step: 3

Operation		Reading	Testing
Program switch position "V"	7	Multimeter must indicate 8 ... 15 V	Component: Control relay, starting motor term. 50
Program switch position "Ω":	-		Operation: Starting signal
Measuring equipment: Multimeter (volt range)			Malfunction: No voltage reading
Measuring range: 0 ... 15 V			
Connection: Test socket red (positive) and black			
Operation in vehicle: Ignition "ON" and operate starting motor			

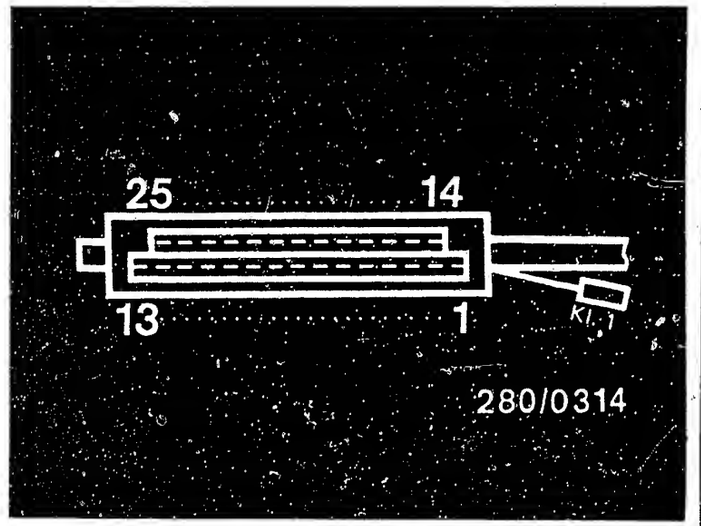
Trouble-shooting:
For testing, remove the wiring-harness plug from the test adapter and use the circuit diagram if necessary.

Test the following leads for continuity using ohmmeter (set value: approx. 0 Ω):

From multiple plug term. 4 to control relay term. 50
From control relay term. 1 to ignition coil term. 1.
From multiple plug term. 5 to electronics ground terminal.

Eliminate contact resistances at the plug-in connections.

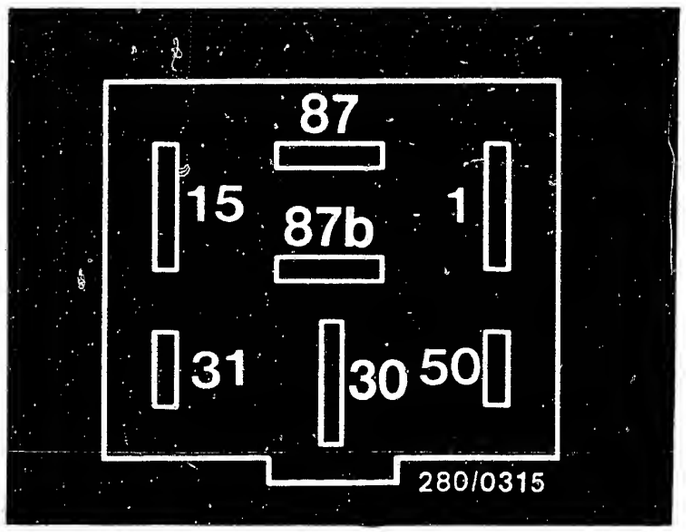
Installation position of components:
1. Control relay: In engine compartment on right-hand side near firewall
2. Electronics ground terminal: On intake manifold on right-hand side near firewall



Kl. = Terminal

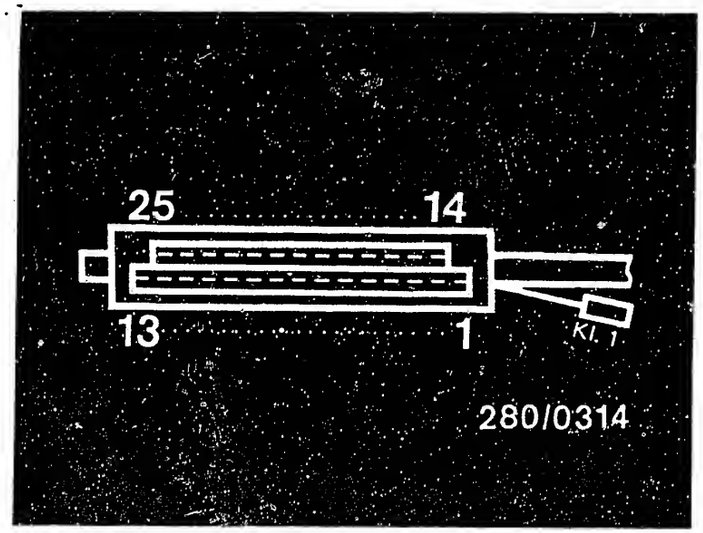
Top view of multiple plug

Control relay
(top view of connection base)



Test step: 4

Operation		Reading	Testing
Program switch position "V":	⬇	Multimeter must indicate 100 ... 200 Ω	Component: Air-flow sensor (temperature sensor I)
Program switch position "Ω":	11		Operation: Resistance between air-flow sensor term. 8 and electronics ground terminal
Measuring equipment: Multimeter (Ω range)			Malfunction: Resistance outside tolerance
Measuring range: x 10 Ω			
Connection: Test sockets blue			
Operation in vehicle:		Trouble-shooting: For testing, remove the wiring-harness plug from the test adapter and use the circuit diagram if necessary.	



Kl. = Terminal

Top view of multiple plug

Test the following leads for continuity using ohmmeter (set value approx. 0 Ω)

1. Auxiliary-air device
From output stage ground terminal term. 26 to auxiliary-air device term. 26.
From auxiliary-air device term. 9 to multiple plug term. 9.
Resistance of auxiliary-air device at term. 26 and term. 9: 35...70 Ω

2. Electric fuel pump
From control relay term. 87b through pump fuse to electric fuel pump (positive terminal).
From electric fuel pump (negative terminal) to vehicle body ground terminal

Continued on B 18

Installation position of components:

1. Auxiliary-air device:
   At front on engine block
2. Electric fuel pump:
   Underneath vehicle, on right-hand side behind rear wheel
3. Pump fuse:
   In fuse box, driver's side under instrument panel on left-hand side
4. Output stage ground terminal:
   On intake manifold on right-hand side near firewall

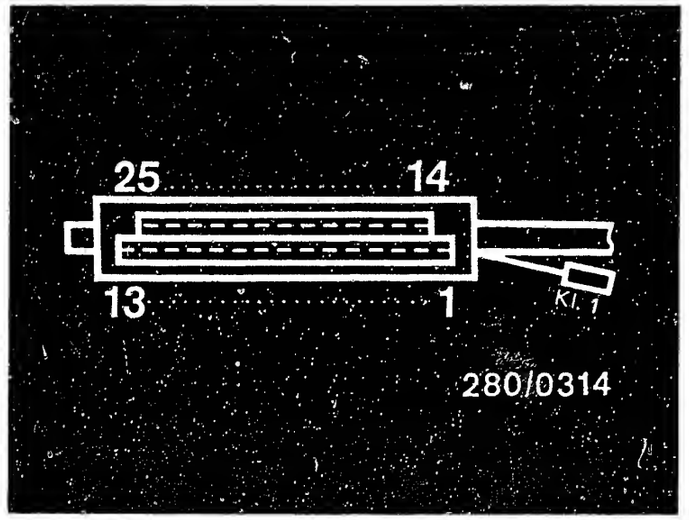
Test step: 4 (continued)

3. Air-flow sensor

From multiple plug term. 8 to air-flow sensor term. 8.
From air-flow sensor term. 5 to electronics ground terminal.
From multiple plug term. 5 to electronics ground terminal.

Eliminate contact resistances in the plug-in connections.

Test step: 5 Operation		Reading	Testing
Program switch position "V"	⬇	Multimeter must indicate 60 ... 1000 Ω	Component: Air-flow sensor (potentiometer)
Program switch position "Ω"	12		Operation: Resistance between air-flow sensor term. 7 and electronics ground terminal
Measuring equipment: Multimeter (Ω - range)			Malfunction: Resistance outside tolerance
Measuring range: x 10 Ω			
Connection: Test sockets blue			
Operation in vehicle: Deflect air-flow sensor flap		Trouble-shooting: For testing, remove the wiring-harness plug from the test adapter and use the circuit diagram if necessary.	



Kl. = Terminal

Top view of multiple plug

Test the following leads for continuity using ohmmeter (set value approx. 0 Ω):

From multiple plug term. 7 to air-flow sensor term. 7
From air-flow sensor term. 5 to electronics ground terminal
From multiple plug term. 5 to electronics ground terminal

Eliminate contact resistances in the plug-in connections.

Installation position of components

1. Air-flow sensor:
In engine compartment front right

2. Electronics ground terminal:
On intake manifold on right-hand side near firewall

Test step: 6

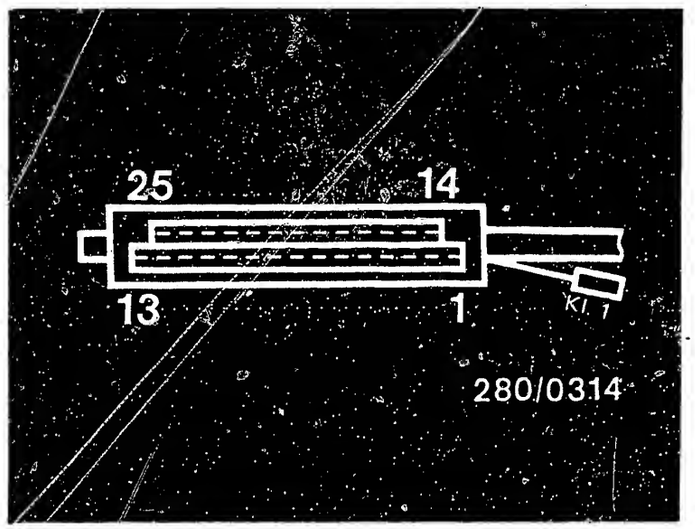
Operation		Reading	Testing
Program switch position "y":	⬇	Multimeter must indicate 30 Ω ... 30 kΩ (depends on temperature) Read off.	Component: Temperature sensor II (engine)
Program switch position "Ω":	13		Operation Resistance betw... control unit term. 10 and electronics ground terminal
Measuring equipment Multimeter (Ω range)			Malfunction Resistance outside tolerance
Measuring range x 10 Ω or x 100 Ω			
Connection Test sockets blue			
Operation in vehicle			

Trouble-shooting:
For testing, remove the wiring-harness plug from the test adapter and use the circuit diagram if necessary.
Measure resistance directly at engine temperature sensor (blue plug).
Ambient temperature (+15°C...+30°C): 1.45...3.3 kΩ
With engine at operating temperature (approx. +80°C): 280...360 Ω

Test the following leads for continuity using ohmmeter (set value approx. 0 Ω):

From multiple plug term. 10 to temperature sensor II (engine) term. 10.
Lead 38 from temperature sensor II to electronics ground terminal.

Eliminate contact resistances in the plug-in connections.



Kl. = Terminal

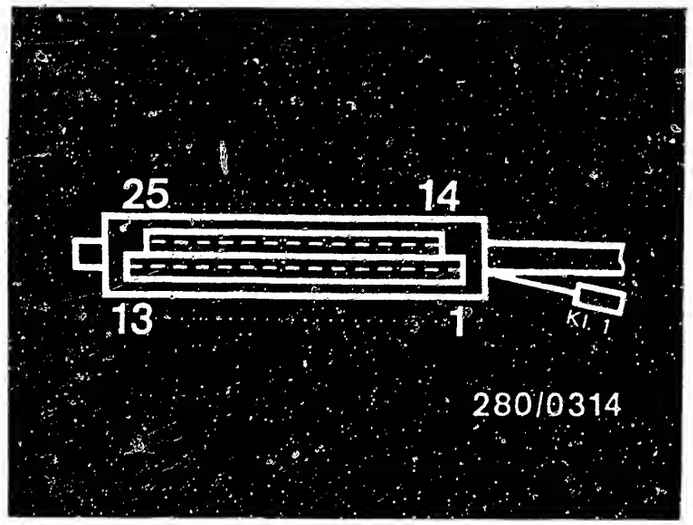
Top view of multiple plug

Installation position of components:

1. Engine temperature sensor
In cooling water circuit at front on engine block

2. Electronics ground terminal
On intake manifold on right-hand side near firewall

Test step: 7 Operation		Reading	Testing
Program switch position "V":	↓	Multimeter must indicate 0 ...10 Ω	Component: Ground connection of output stage
Program switch position "Ω":	14		
Measuring equipment: Multimeter (Ω range)			Operation: Ground connection of control unit
Measuring range: x 1 Ω			Malfunction: Resistance outside tolerance
Connection: Test sockets blue			
Operation in vehicle:		Trouble-shooting: For testing, remove the wiring-harness plug from the test adapter and use the circuit diagram if necessary.	



Kl. = Terminal

Top view of multiple plug

Test the following leads for continuity using ohmmeter (set value approx. 0 Ω):
From multiple plug term. 13 to output stage ground terminal.
From multiple plug term. 5 to electronics ground terminal.

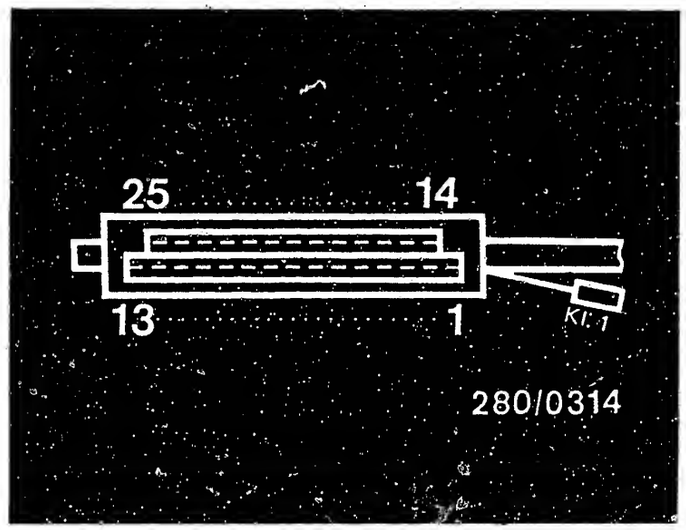
Eliminate contact resistances at the plug-in connections.

Installation position of components:

1. Output stage ground terminal
On intake manifold on right-hand side near firewall

Test step: 8

Operation		Reading	Testing
Program switch position "V"	↓	Multimeter must indicate 0 ... 10 Ω	Component: Throttle-valve switch (idle contact)
Program switch position "Ω":	16		
Measuring equipment: Multimeter (Ω range)			Operation: Resistance between throttle-valve switch term. 2 and term.9
Measuring range: x 1 Ω			Malfunction: Resistance outside tolerance
Connection: Test sockets blue			
Operation in vehicle: Accelerator in rest position		Trouble-shooting: For testing, remove the wiring-harness plug from the test adapter and use the circuit diagram if necessary.	



Top view of multiple plug

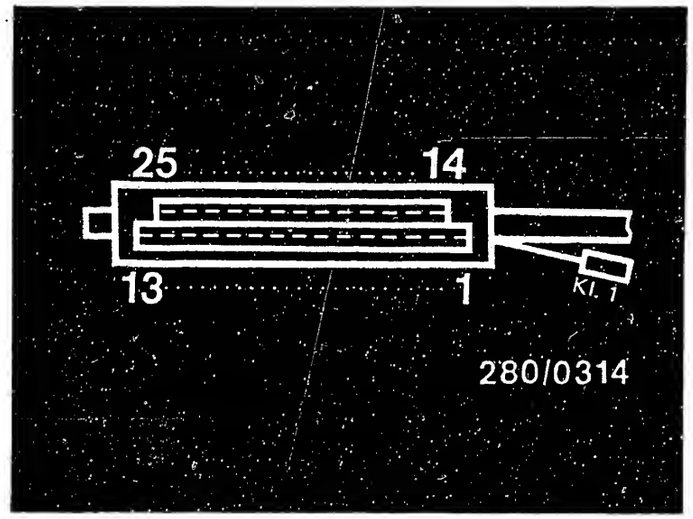
Adjusting the throttle-valve switch (on intake manifold on right-hand side):
Slightly loosen the fastening screws of the throttle-valve switch. Connect ohmmeter to throttle-valve switch between term. 2 and term. 9. Turn throttle-valve switch in an anti-clockwise direction until idle contact (microswitch) is heard to click.(Reading 0 Ω).
Checking the adjustment:
Pull on the throttle cable slightly. The idle contact (microswitch) must be heard to click. (Reading ∞ Ω)

Test the following leads for continuity using ohmmeter (set value approx. 0 Ω):
From multiple plug term. 2 to throttle-valve switch term. 2
From throttle-valve switch term. 9 to multiple plug term. 9

Eliminate contact resistances in the plug-in connections.

Test step: 9 Operation		Reading	Testing
Program switch position "V":	↓	Multimeter must indicate 0 ... 10 Ω	Component: Throttle-valve switch (full-load contact)
Program switch position	17		
Measuring equipment: Multimeter (Ω range)			Operation Resistance between throttle-valve switch term. 3 and term. 9
Measuring range: x 1 Ω			Malfunction: Resistance outside tolerance
Connection: Test sockets blue			
Operation in vehicle: Accelerator in full-load position			

Trouble-shooting:
For testing, remove the wiring-harness plug from the test adapter and use the circuit diagram if necessary.



Top view of multiple plug

Test the following leads for continuity using ohmmeter (set value approx. 0 Ω):
From multiple plug term. 3 to throttle-valve switch term. 3
From throttle-valve switch term. 9 to multiple plug term. 9

Eliminate contact resistances in the plug-in connections.

Installation position of components:

1. Throttle-valve switch
On intake manifold on right-hand side

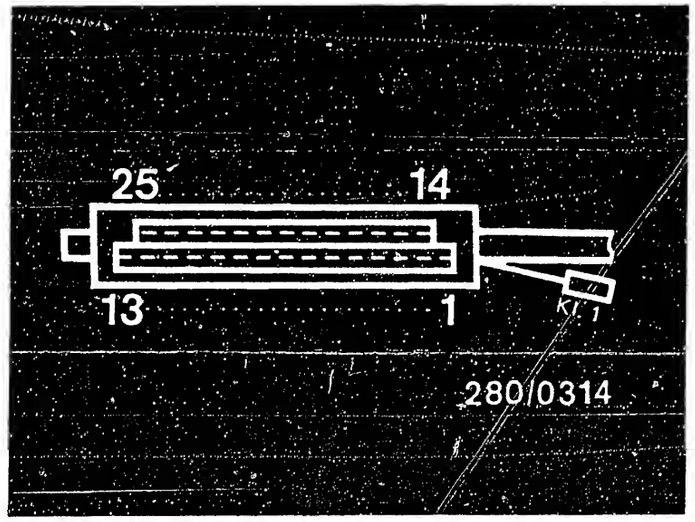
Test step: 10

Operation		Reading	Testing
Program switch position "V":	↓	Multimeter indication + 20°C: 6.75 ... 9.0 Ω + 80°C: 7.10 ... 9.35 Ω	Component: Solenoid-operated injection valve
Program switch position "Ω":	19		Operation: Resistance of all solenoid-operated injection valves (in parallel)
Measuring equipment: Multimeter (Ω range)			Malfunction: Resistance outside tolerance
Measuring range Small setting			
Connection Test sockets in blue			
Operation in vehicle			

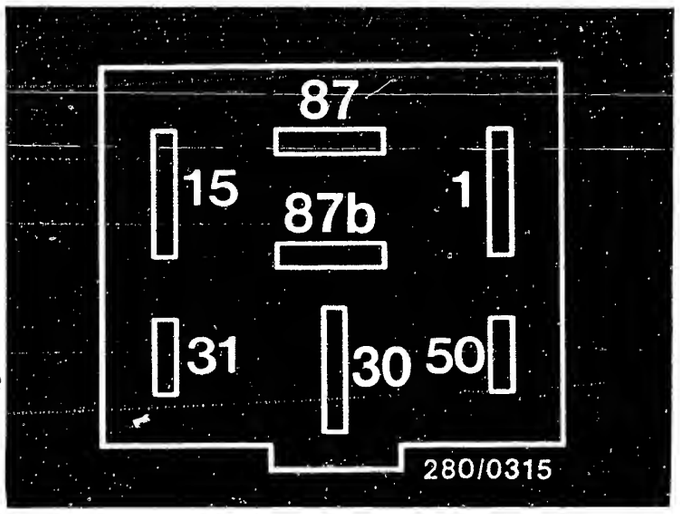
Trouble-shooting:
For testing, remove the wiring-harness plug from the test adapter and use the circuit diagram if necessary.

If reading too high: open circuit in valve coil or valve connector has dropped off.
Check seat of locking lugs.

Test the following leads for continuity using ohmmeter (set value approx. 0 Ω):
From multiple plug term. 12 to the solenoid-operated injection valves.
From the solenoid-operated injection valves to control relay term. 87.
From the solenoid-operated injection valves to multiple plug term. 9.
Resistance measurement at solenoid-operated injection valve:
Ambient temperature (+15°C...+30°C): 15...17.5 Ω
With engine at operating temperature (approx.+80°C): 17...20 Ω
Installation position of components: 1. Injection valves: On intake manifold on left-hand side
2. Control relay: In engine compartment on right-hand side near firewall.



Top view of multiple plug



Control relay
(top view of connection base)

Testing with the universal adapter is now completed. If the fault has not been found or if you require further information and instructions on how to remedy the fault, continue with the trouble-shooting program of your choice.

Detailed trouble-shooting → see B 3
Direct trouble-shooting → see B 5

Trouble-shooting program according to customer complaints

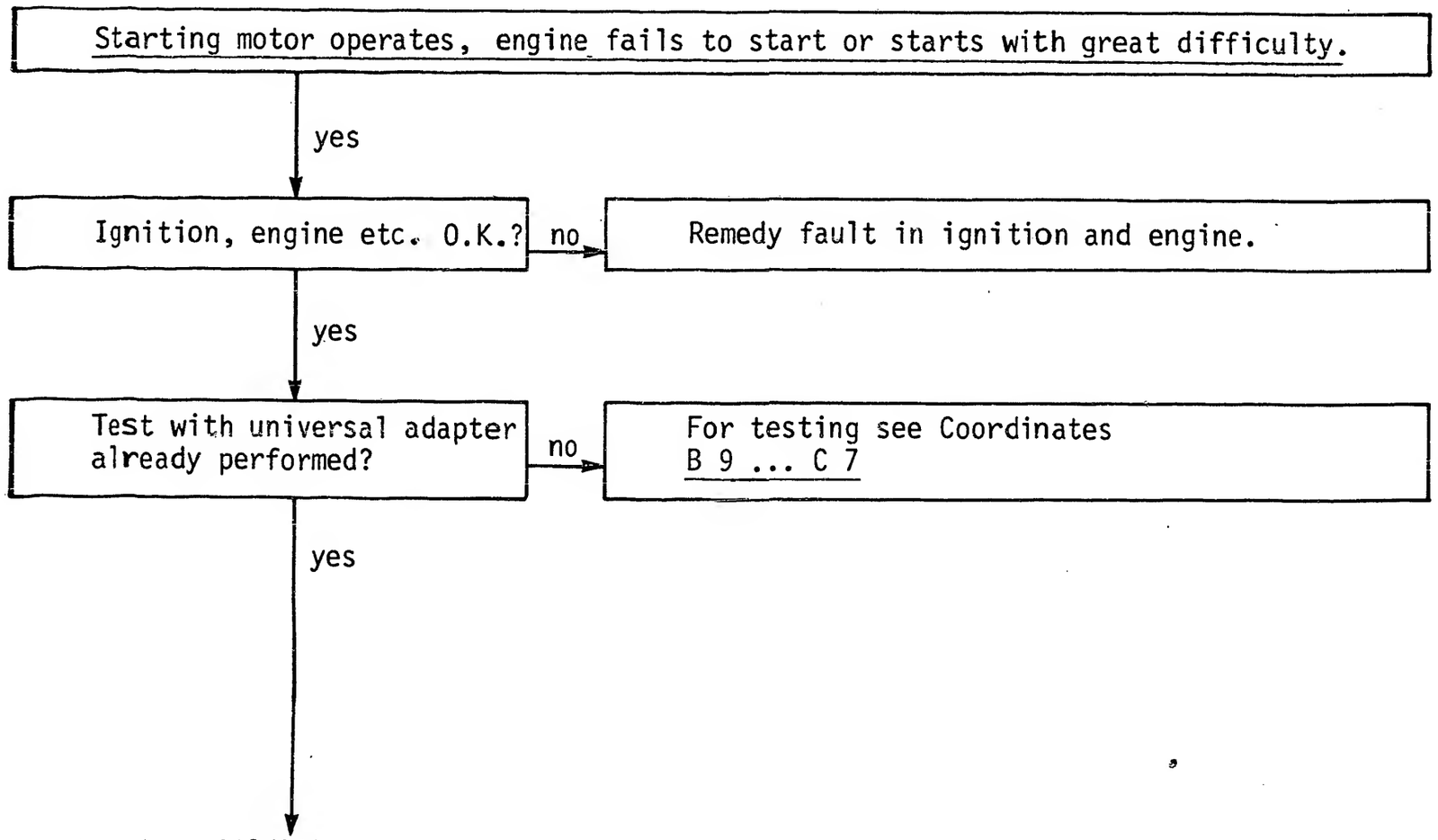
How to use the following trouble-shooting program

The program is divided into 3 rows of boxes:
1. The left-hand row contains the questions on the tests.
2. The middle row contains descriptions of the testing and adjustment operations on the components.
3. The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.



Starting motor operates, engine fails to start or starts only with great difficulty

Fuel pump operating?
(listen)
Control relay O.K.?

no

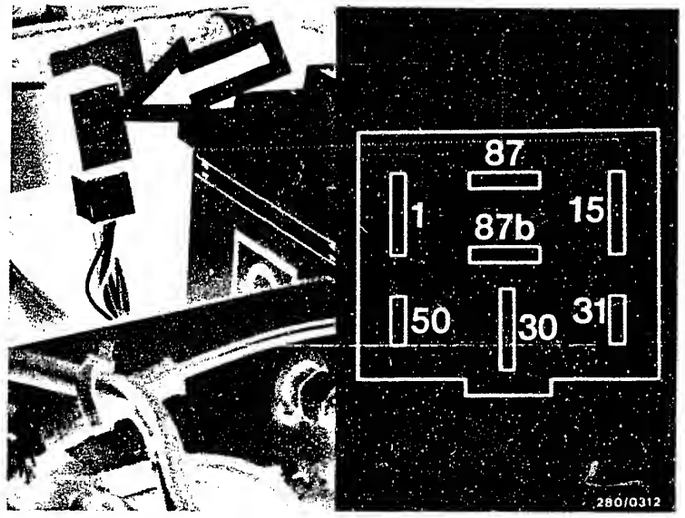
1. Testing the control relay
For testing, unscrew the control relay and turn round so that the connection base is accessible from below. Control relay and connection base remain plugged together. Check the power supply. Switch on the ignition. Using voltmeter, measure battery voltage at term. 30, term. 15 and term. 50 (starting motor) to vehicle ground. Set value: 7...15 V. If no voltage, check connecting cables.

2. Start engine, check voltage at pump fuse (in fuse box; fuel-injection system).
Manta: No. 7 (8A)
Rekord: No. 10 (10A plug-in fuse)
and at control relay term. 87b:
Voltage at term. 87b → replace pump fuse.
No voltage at term. 87b → replace control relay.

3. Ground connection of fuel pump O.K.?
If not → check ground terminal and ground cable for open circuit and proper connection.
Ground terminals:
Manta: Near fuel pump on vehicle body.
Rekord: In luggage compartment between the two wheel boxes behind rear seat panel.

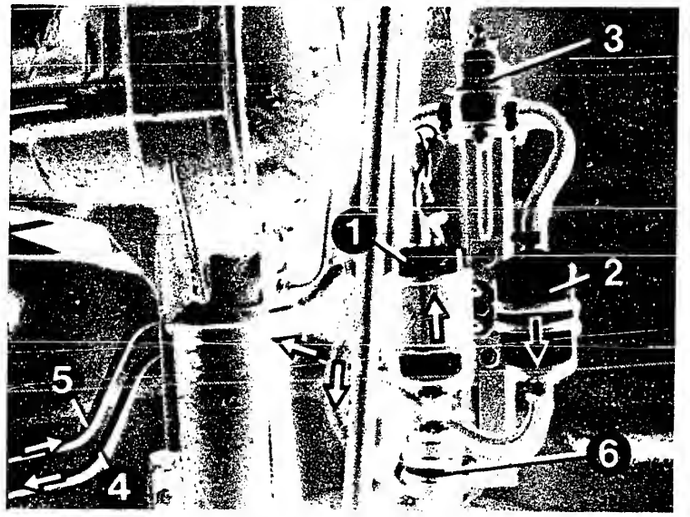
yes

Continued on C12/C13



Arrow = control relay
Connection base (viewed from below)

1=Electric fuel pump
2=Fuel filter
3=Fuel-line-pressure damper
4=Fuel delivery line
5=Fuel return line
6=Fuel strainer
Arrows=direction of fuel flow



Starting motor operates, engine fails to start or starts only with great difficulty

Fuel pump operating?
Control relay O.K.?
(continued)

no →

4. Fuel pump operating?
If not → start engine and test voltage at disconnected pump plug (set value min. 12V).
If voltage present → replace fuel pump.

yes

Fuel pressure O.K.?
Test specification:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

Test specification reached?

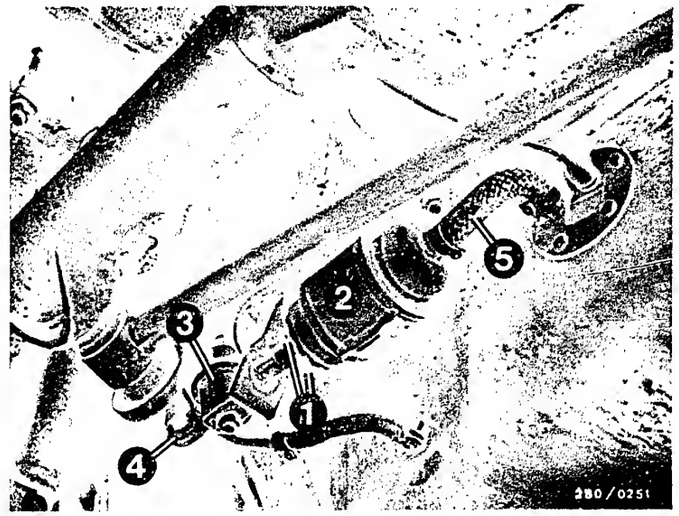
no →

Testing the fuel pressure
Connect the connections of the pressure testers into the fuel delivery line.
If using pressure tester KDJE-P 100, close the hollow screw when testing the LE-Jetronic.

Caution: When removing the fuel hose make sure that no fuel gets onto hot parts of the engine.

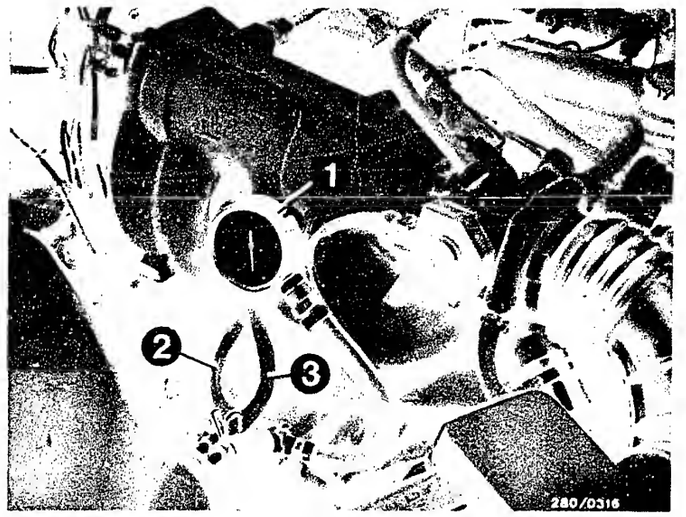
yes

Continued on C14/C15



1=Electrical connections
2=Electric fuel pump
3=Fuel-line-pressure damper
4=Fuel delivery line
5=Fuel intake line

1=Pressure gauge (pressure tester 1 687 231 154)
2=Fuel delivery line
3=Fuel return line



Starting motor operates, engine fails to start or starts only with great difficulty

Fuel pressure O.K.?

Test specification:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

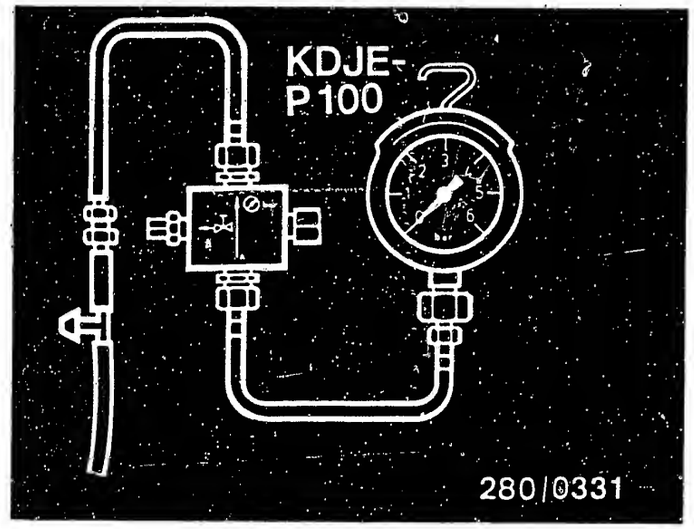
Test specification reached?

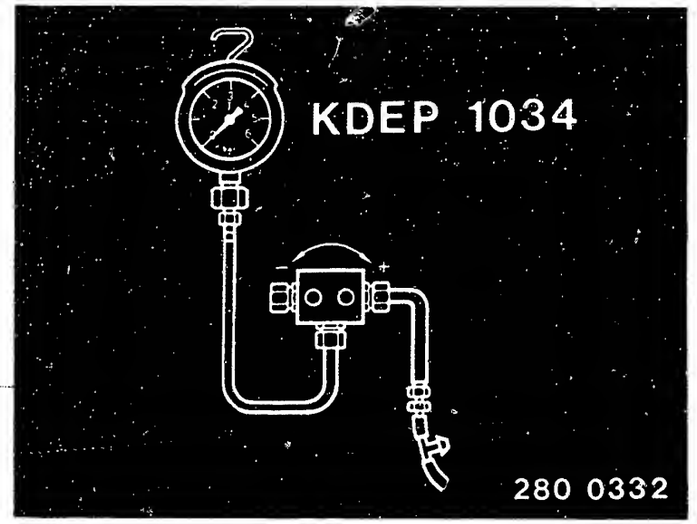
no

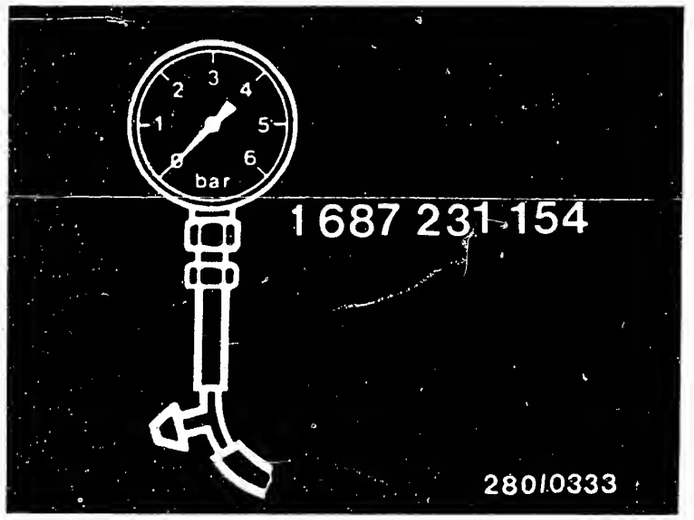
Unscrew the fuel delivery line (at the junction at wheel box on right-hand side).
Plug the Y-piece of the pressure tester onto the hose to the fuel-distribution pipe. Plug the hose of the pressure tester onto the fuel delivery line.
Make sure there are no leaks.

yes

Continued on C16/C17







Starting motor operates, engine fails to start or starts only with great difficulty

Fuel pressure O.K.?

Test specification:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

Pressure regulator O.K.?
Test specification reached?

no →

Remove the control relay. Fit a jumper into the connection base between term. 87b and term. 30.
Fuel pump must operate
Fuel pump pressure:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

Caution!
Remove the jumper and fit the control relay in position. Let the engine idle → fuel pump pressure approx. 2.0 bar or 2.5 bar.

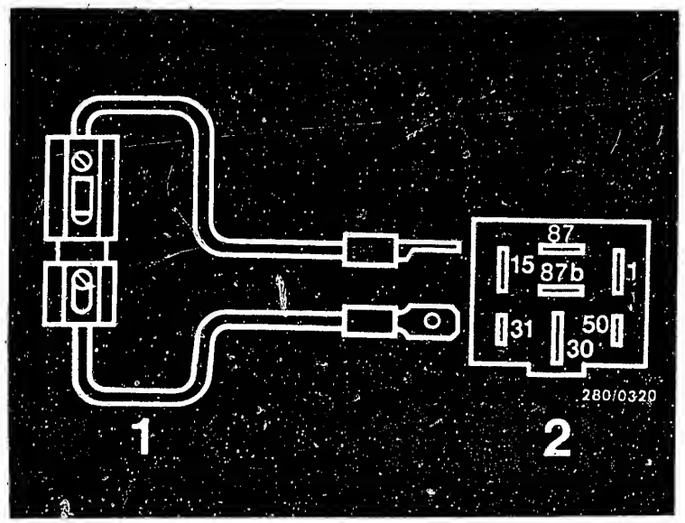
Testing the pressure regulator
Remove the control relay and fit a jumper into the connection base between term. 87b and term. 30.
Electric fuel pump must operate.
Fuel pump pressure:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

Fuel pressure of 2.3 bar or 2.8 bar not reached:
1. Slowly pinch off fuel return line: (caution: do not load pressure gauge above 6 bar).

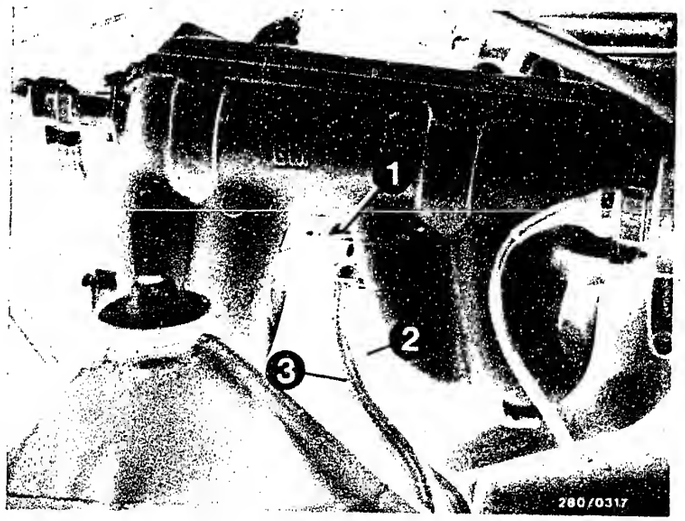
Pressure rises above 4 bar → replace pressure regulator.
Pressure remains below 4 bar → replace fuel pump.

yes

Continued on C18/C19



Jumper (user-fabricated)
1=Fuse holder with 10 A fuse
2=Top view of connection base



1=Pressure regulator
2=Fuel delivery line
3=Fuel return line

Starting motor operates, engine fails to start or starts only with great difficulty

Fuel pressure O.K.?

Test specification:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

Pressure regulator O.K.?
Test specification reached?

no

Opel Manta 2.0 l:

2. Check fuel delivery line and fuel filter for throughflow.
3. Strainer in tank clogged.
4. Corrosion in tank.

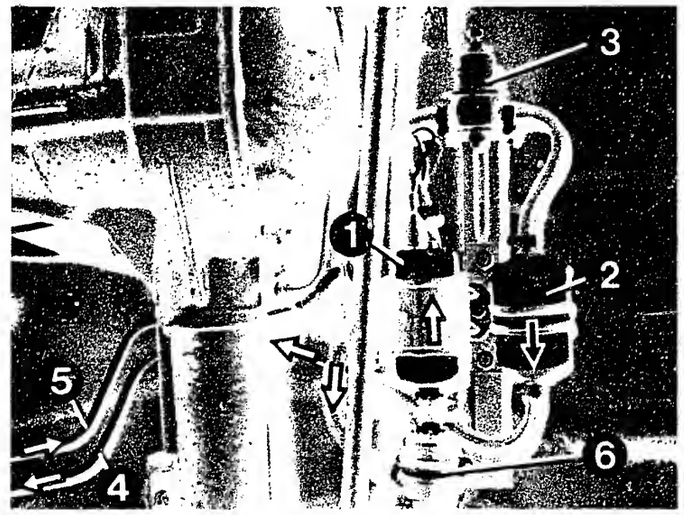
Fuel pressure of 2.7 bar or 3.2 bar exceeded:

1. Fuel return line clogged or pinched.
2. Replace pressure regulator.

Caution!
Jumper must be removed again after test is completed, and the control relay must be fitted in position.

yes

Continued on C20/C21



Arrangement of components in Opel Manta

1=Electric fuel pump
2=Fuel filter
3=Fuel-line-pressure damper
4=Fuel delivery line
5=Fuel return line
6=Fuel strainer

Arrows=direction of fuel flow

Starting motor operates, engine fails to start or starts only with great difficulty

Fuel pressure O.K.?

Test specification:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

Pressure regulator O.K.?
Test specification reached?

no →

Opel Rekord 2.0 l:

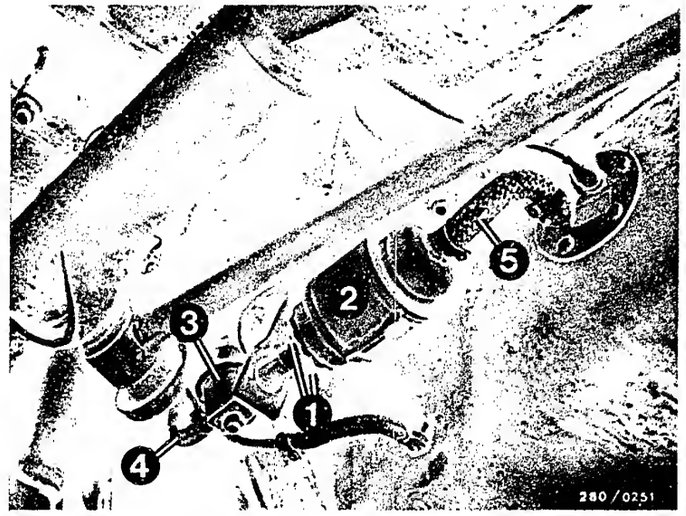
2. Check fuel delivery line and fuel filter for throughflow.
3. Strainer in tank clogged.
4. Corrosion in tank.

Fuel pressure of 2.7 bar or 3.2 bar exceeded:
1. Fuel return line clogged or pinched.
2. Replace pressure regulator.

Caution!
Jumper must be removed again after test is completed and the control relay must be fitted in position.

yes

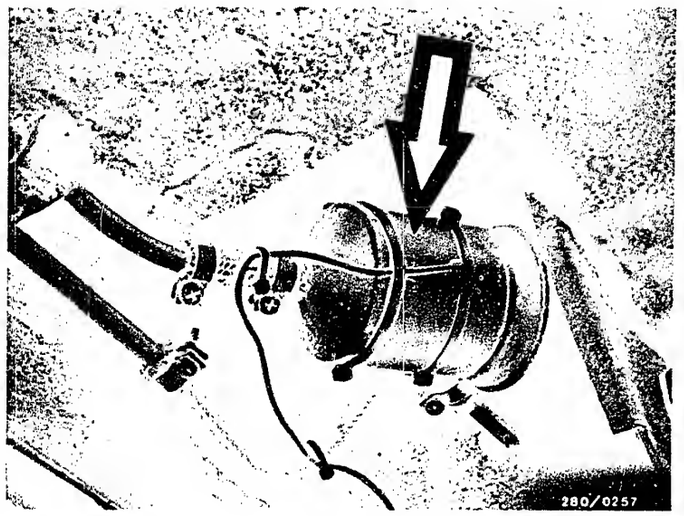
Continued on C22/C23



Arrangement of components in Opel Rekord

1=Electrical connections
2=Electric fuel pump
3=Fuel-line-pressure damper
4=Fuel delivery line
5=Fuel intake line

Arrow = fuel filter



Starting motor operates, engine fails to start or starts only with great difficulty

Start valve O.K.?

no →

Functional test:
Check the power supply to the start valve when starting. To do this, remove the plug from the start valve and connect voltmeter to term. 30 and term. 29/term. 4 of the start valve plug.
1. Coolant temperature at ambient temperature (+15°C...+30°C): voltage reading min. 6 V
2. Coolant temperature at engine temperature (approx.+80°C): voltage reading approx. 0 V.

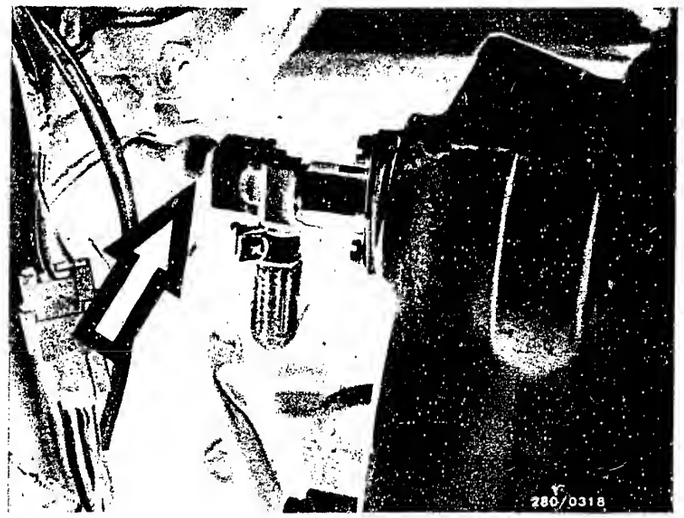
Test the following leads for continuity using ohmmeter. Set value: approx. 0 Ω. Lead from term. 30 to thermo-time switch term. W. Lead from term. 29 to thermo-time switch term. G. Lead from term. 4 to control relay term. 50. Check ground connection of thermo-time switch.

Electrical test of start valve:
Connect ohmmeter to start valve term. 29 and term. 30: set value approx. 4 Ω.

Mechanical test of start valve:
Remove start valve from intake manifold and hold in a container. (Caution! fire hazard!). When starting at temperatures below +30°C the start valve must squirt (max. 8 secs.). At above +40°C the start valve must not squirt. With the ignition switched on and the pressure built up, the start valve must likewise not squirt.

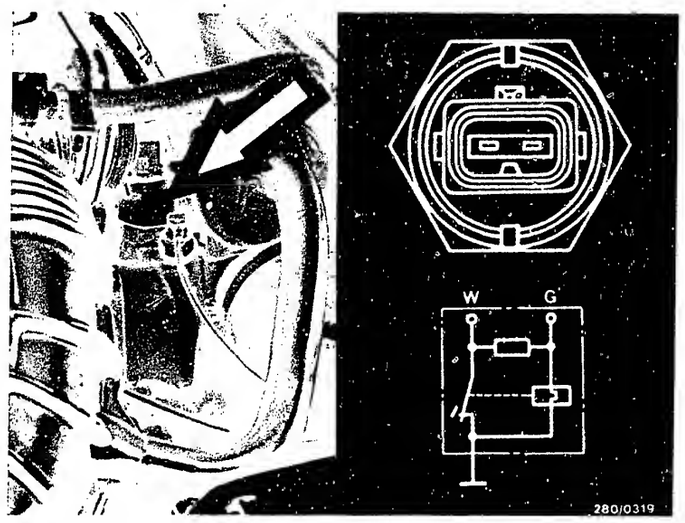
yes

Continued on D1/D2



Arrow=start valve

Arrow=thermo-time switch



Starting motor operates, engine fails to start or starts only with great difficulty

Start valve O.K.? (continued)

no

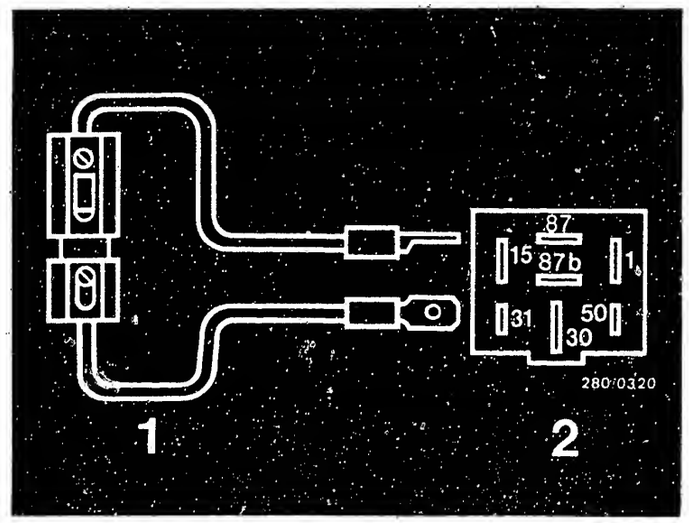
Carry out squirt test when engine is at operating temperature (+80°C) as follows: Remove plug from thermo-time switch and ground term. W.

Testing the start valve for leaks

1. When installed:
Pinch off the fuel delivery line at the start valve. If engine then runs smoothly, replace start valve.
2. When removed:
Remove the start valve (caution! fire hazard!). Fuel lines and electric leads remain connected (place collector vessel under the start valve). Build up the fuel pressure (remove control relay and fit jumper into connection base between term. 87b and term. 30).
Caution!
The jumper must be removed again after test is completed and the control relay must be fitted in position.

Test specification: Within one minute max. 1 drop may form at the mouth of the valve.

yes



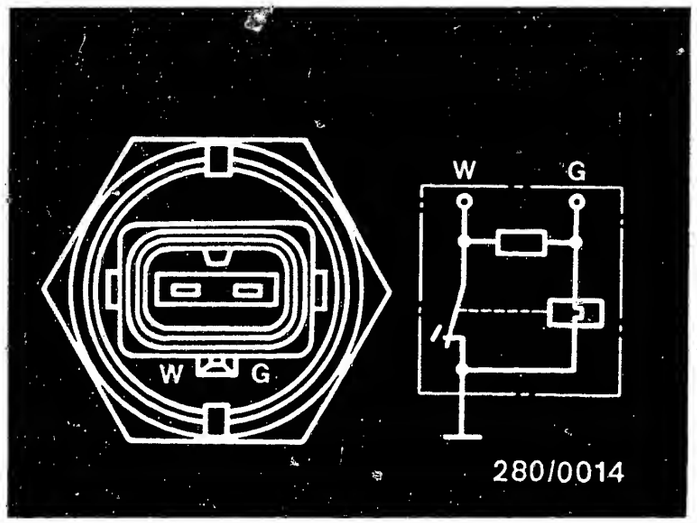
Jumper (user-fabricated)
1=Fuse holder with 10 A fuse
2=Top view of connection base

Thermo-time switch O.K.?

no

Electrical test:
Test the thermo-time switch 35°C/8 sec. as follows: Remove the plug and measure resistance directly at thermo-time switch with ohmmeter.

yes



Continued on D3/D4

Starting motor operates, engine fails to start or starts only with great difficulty

Thermo-time switch O.K.? (continued)

no →

1. Between term. "G" and ground at ambient temperature (below +30°C): 25...40 Ω
at engine temperature (above +40°C): 50...80 Ω
2. Between term. "W" and ground at ambient temperature (below +30°C): 0 Ω
at engine temperature (above +40°C): 100..160Ω
3. Between term. "G" and ground at ambient temperature (below +30°C): 25...40Ω
at engine temperature (above +40°C): 50...80Ω

yes ↓

Auxiliary-air device tested? (mechanically O.K.?)

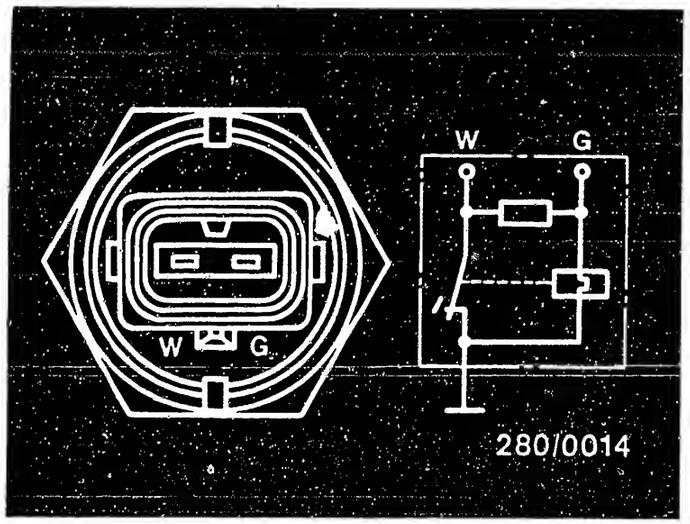
no →

Testing:
1. Visual examination of auxiliary-air device:
Remove hoses and look down, using a small mirror if necessary. When cold, the device must be open; when the engine is warm, it must be closed. If not, replace auxiliary-air device.

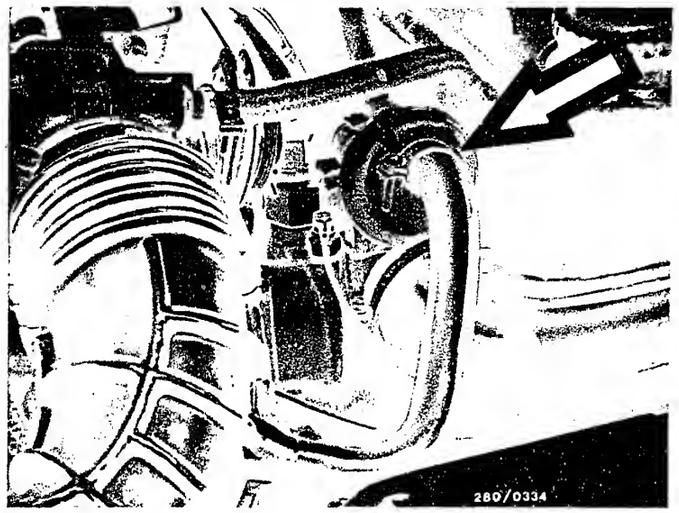
2. Functional test of auxiliary-air device:
With the engine cold, pinch off hose to auxiliary-air device. Engine speed must drop. With the engine warm, pinch off hose to auxiliary-air device. Engine speed must not drop. If incorrect, replace auxiliary-air device (pay attention to direction of flow).

yes ↓

Continued on D5/D6



Arrow=auxiliary-air device



Starting motor operates, engine fails to start or starts only with great difficulty

Auxiliary-air device tested? (continued)
Electrically O.K.?

no → Remove plug from auxiliary-air device. Connect ohmmeter to both terminals of auxiliary-air device: Test specification: 35...70 Ω.
If the reading is outside tolerance, replace auxiliary-air device.

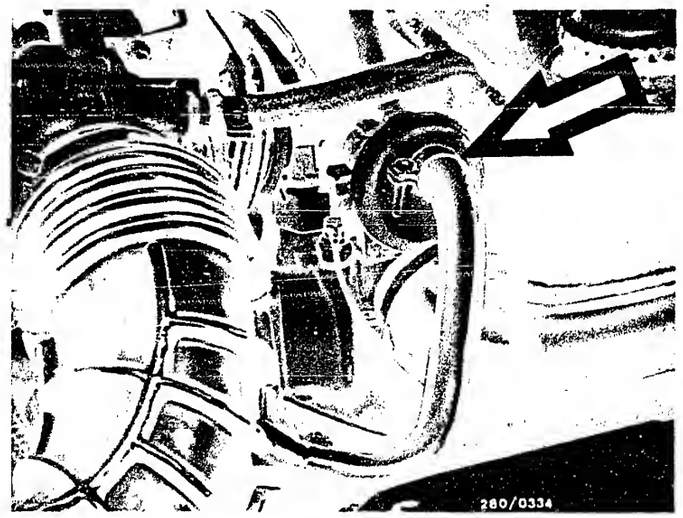
yes

Air-flow sensor O.K.?

no → Testing:
Open air-flow sensor flap by hand. It must be possible to open the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. When the air-flow sensor flap is opened it must not catch at any point. Watch for any indications of abrasion or rubbing. Clean air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are any signs of abrasion or rubbing, replace the air-flow sensor. Connect ohmmeter to term. 8 and term. 9 of air-flow sensor. Test specification: 160...300 Ω. Connect ohmmeter to term. 7 and term. 5 of air-flow sensor. Deflect air-flow sensor flap. Test specification: 60...1000 Ω. Sensor flap must return to rest position. If not, the stopper or the sensor flap is bent. Replace air-flow sensor.

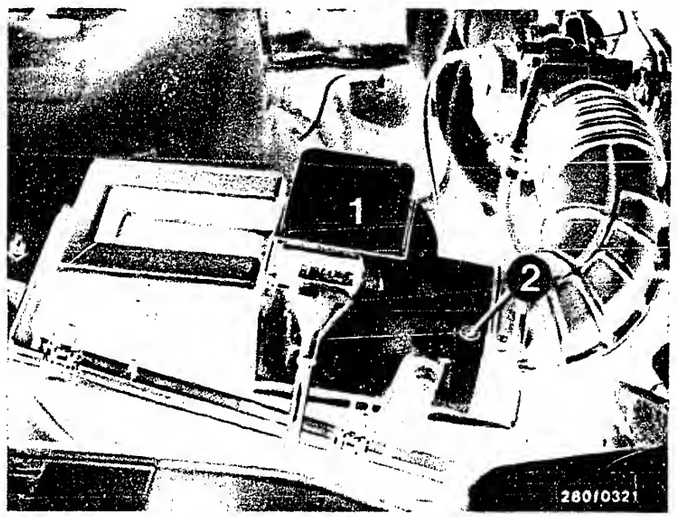
yes

Continued on D7/D8



Arrow=auxiliary-air device

1=Air-flow sensor
2=CO adjusting screw



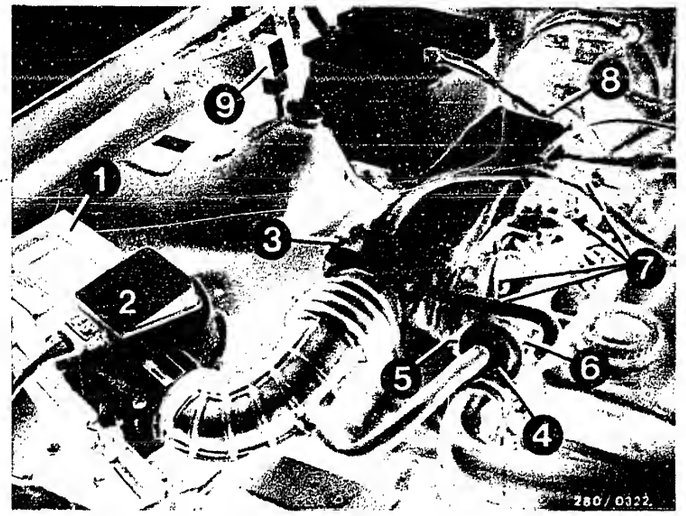
Starting motor operates, engine fails to start or starts only with great difficulty

Are all hose lines and electric leads securely attached? visual examination.
Is the air-intake system leak-tight?

no → Check whether hoses of air-intake system and of fuel line system are securely attached, not kinked or damaged. If necessary, replace hoses. Eliminate leaks with new seals or by re-tightening the connecting screws.
Checking for leaks:
Seal off exhaust tail pipe. Screw off hose from air filter to air-flow sensor on air-flow sensor and seal off air-flow sensor duct. Pull off hose after auxiliary-air device and blow air (0.3 bar gauge pressure) into the intake manifold with a compressed-air gun. Seal off connection port on auxiliary-air device. Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Bubbling or foaming indicates a leak.
Check electric contacts for loose connection.

yes

Continued on D9/D10



1=Air filter
2=Air-flow sensor
3=Throttle-valve switch
4=Auxiliary-air device
5=Thermo-time switch
6=Temperature sensor II (water)
7=Solenoid-op. injection valves
8=Start valve
9=Control relay

Starting motor operates, engine fails to start or starts only with great difficulty

Testing completed for customer complaint.

"Starting motor operates, engine fails to start or starts only with great difficulty"

Customer complaint remedied?

no

Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates B 3...B 8). If the fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinate B 3/ B 4).
- Engine not mechanically O.K. (compression, valve setting, valve timing, worn camshaft).

Trouble-shooting program according to customer complaints

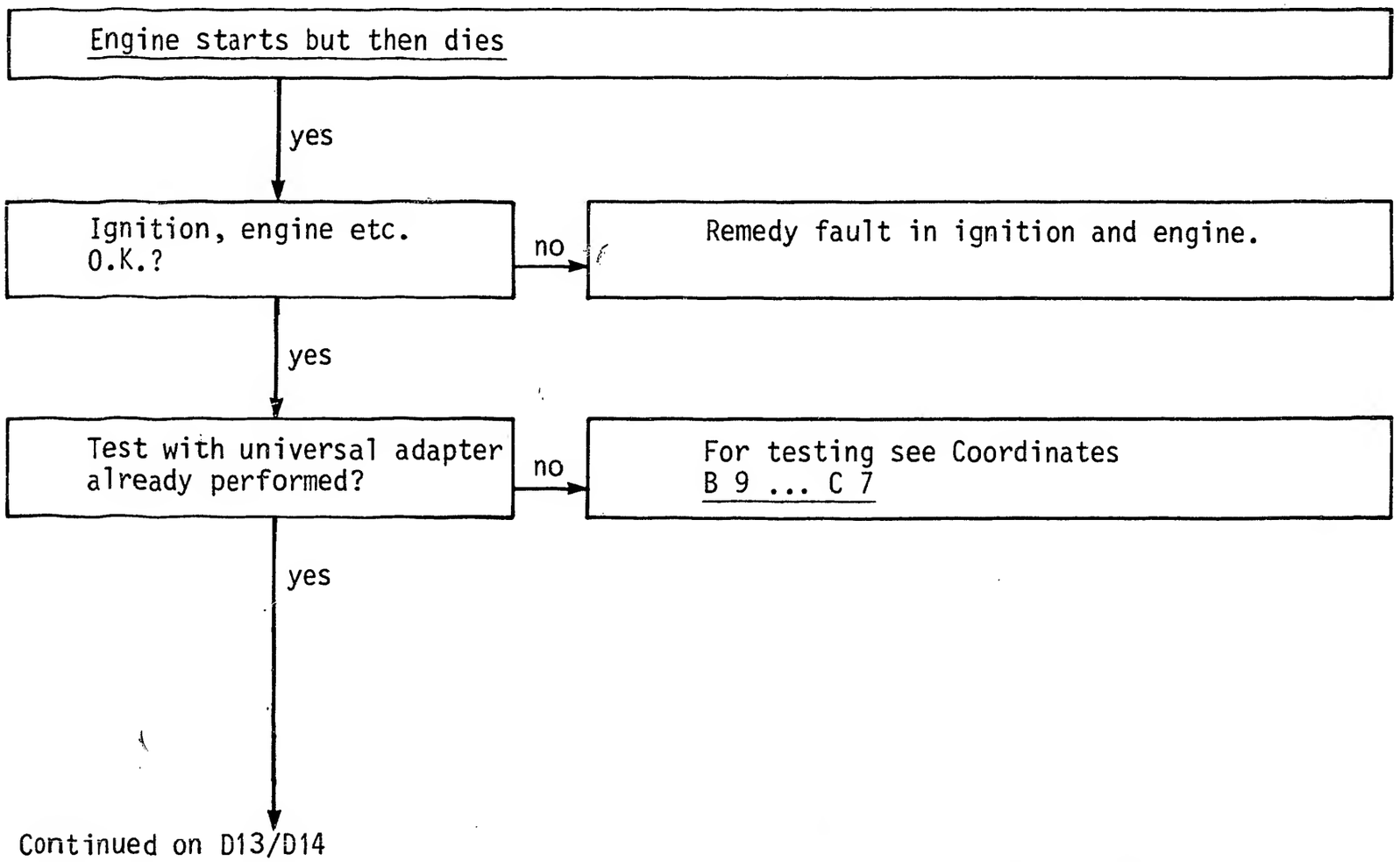
How to use the following trouble-shooting program

The program is divided into 3 rows of boxes:
1. The left-hand row contains the questions on the tests.
2. The middle row contains descriptions of the testing and adjustment operations on the components.
3. The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.



Continued on D13/D14

Engine starts but then dies (continued)

Does fuel pressure remain constant after the engine has started?

no →

Check the control relay:
Connect motortester with special input to control relay term. 1 and ground and start engine. Are there voltage peaks? If not, test lead from control relay term. 1 to ignition coil term. 1 for continuity using ohmmeter (set value approx 0 Ω). If O.K., check ignition system.

Further trouble-shooting:
Test the following leads for continuity using ohmmeter (set value approx. 0 Ω): lead 28 from control relay term. 87b to pump fuse and electric fuel pump and ground cable of electric fuel pump. In addition, clean terminals and eliminate loose contacts.

yes

Fuel pressure O.K.?

Test specification:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

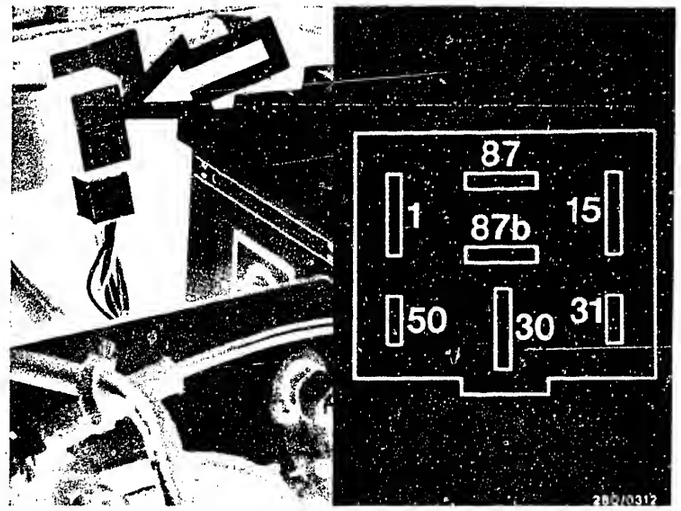
Test specification reached?

no →

Testing the fuel pressure
Connect the connections of the pressure tester into the fuel delivery line. If using pressure tester KDJE-P 100, close the hollow screw when testing the L-Jetronic.
Caution:
When removing the fuel hose make sure that no fuel gets onto hot parts of the engine.

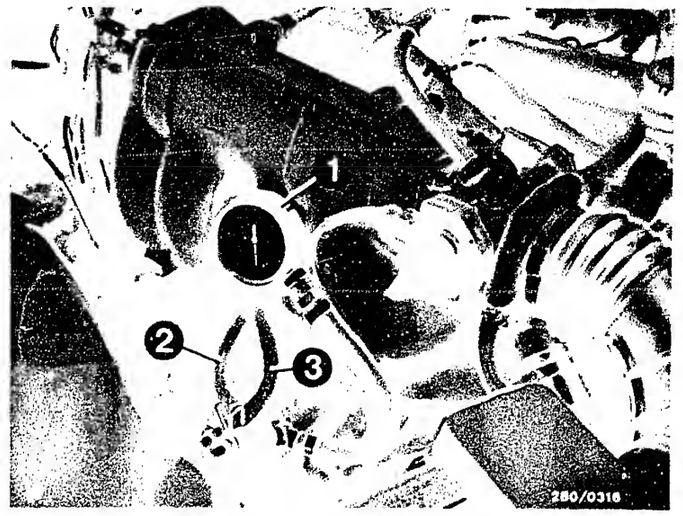
yes

Continued on D15/D16



Arrow=control relay
Connection base (viewed from below)

1=Pressure gauge (pressure tester 1 687 231 154)
2=Fuel delivery line
3=Fuel return line



Engine starts but then dies (continued)

Fuel pressure O.K.?

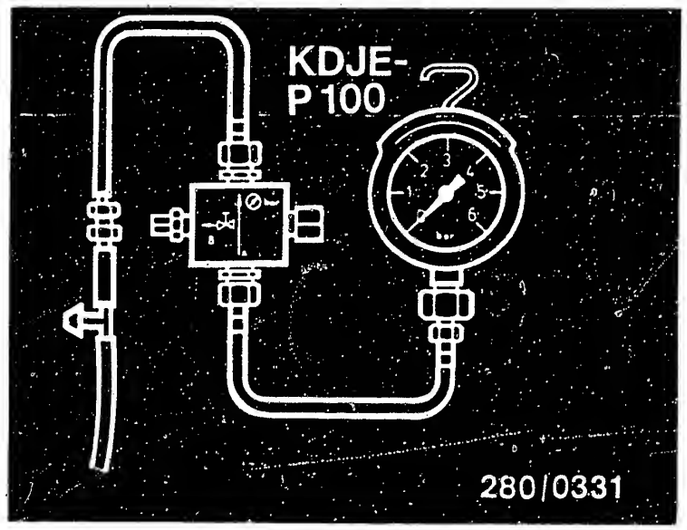
Test specification:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

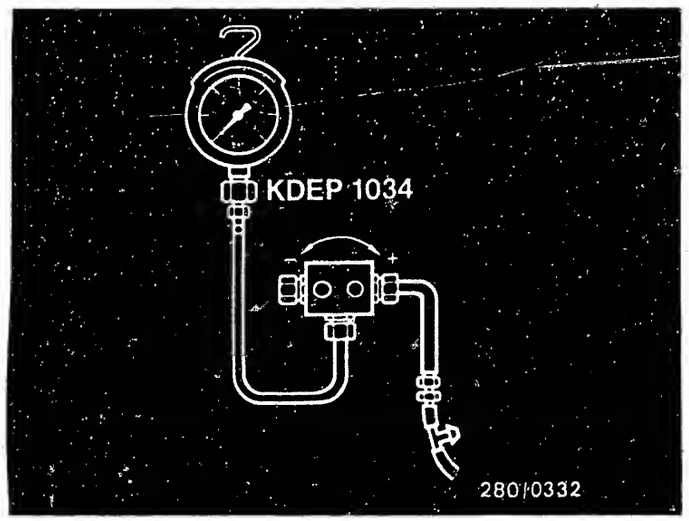
Test specification reached?

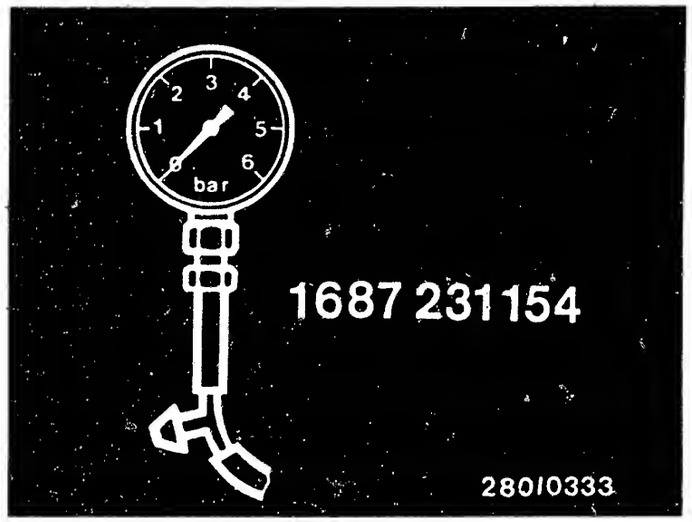
no → Unscrew fuel delivery line (at junction on wheel box on right-hand side).
Plug the Y-piece of the pressure tester onto the hose to the fuel-distribution pipe. Plug the hose of the pressure tester onto the fuel delivery line.
Make sure there are no leaks.

yes

Continued on D17/D18







Engine starts but then dies (continued)

Fuel pressure O.K.?

Test specification:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

Pressure regulator O.K.?
Test specification reached?

no →

Remove the control relay. Fit a jumper into the connection base between term. 87b and term. 30.
Fuel pump must operate
Fuel pump pressure:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

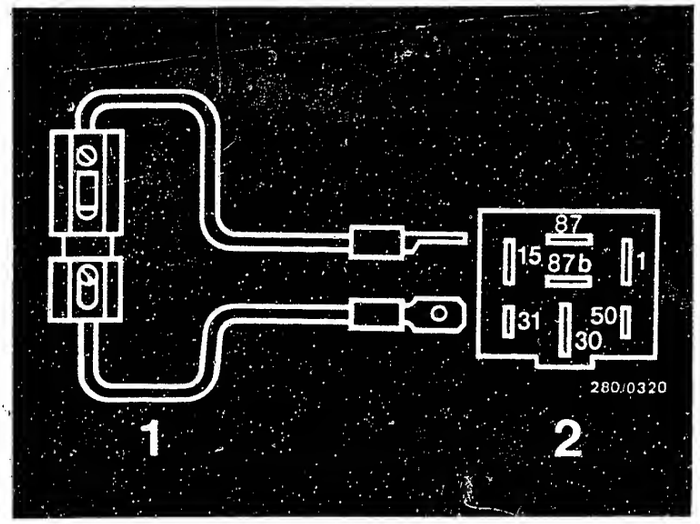
Caution!
Remove the jumper and fit the control relay in position. Let the engine idle → fuel pump pressure approx. 2.0 bar or 2.5 bar.

Testing the pressure regulator
Remove the control relay and fit a jumper into the connection base between term. 87b and term. 30.
Electric fuel pump must operate.
Fuel pump pressure:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

Fuel pressure of 2.3 bar or 2.8 bar not reached:
1. Slowly pinch off fuel return line: (caution: do not load pressure gauge above 6 bar).

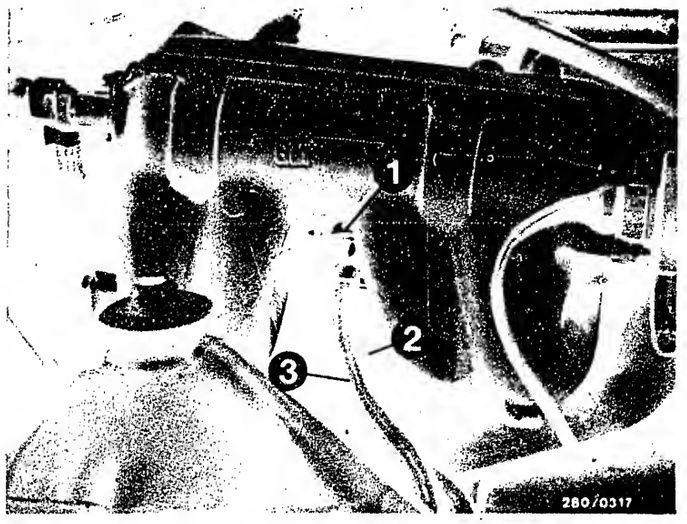
Pressure rises above 4 bar → replace pressure regulator.
Pressure remains below 4 bar → replace fuel pump.

yes



Jumper (user-fabricated)
1=Fuse holder with 10 A fuse
2=Top view of connection base

1=Pressure regulator
2=Fuel delivery line
3=Fuel return line



Continued on D19/D20

Engine starts but then dies (continued)

Fuel pressure O.K.?

Test specification:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

Pressure regulator O.K.?
Test specification reached?

no

Opel Manta 2.0 l:

2. Check fuel delivery line and fuel filter for throughflow.
3. Strainer in tank clogged.
4. Corrosion in tank.

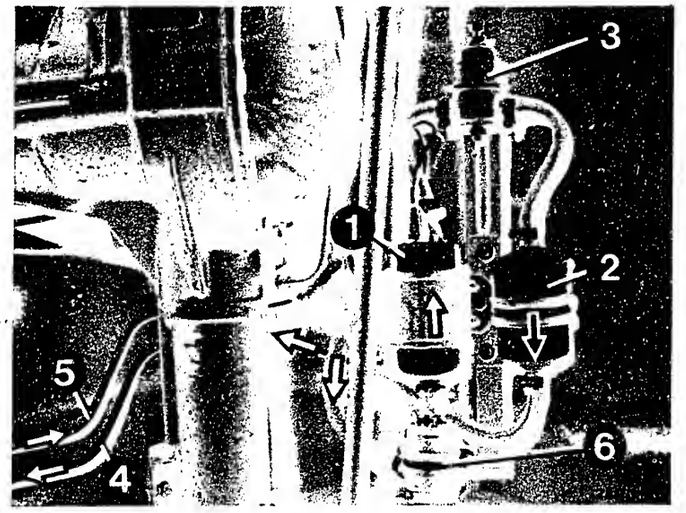
Fuel pressure of 2.7 bar or 3.2 bar exceeded:

1. Fuel return line clogged or pinched.
2. Replace pressure regulator.

Caution!
Jumper must be removed again after test is completed, and the control relay must be fitted in position.

yes

Continued on D21/D22



Arrangement of components in Opel Manta

1=Electric fuel pump
2=Fuel filter
3=Fuel line-pressure damper
4=Fuel delivery line
5=Fuel return line
6=Fuel strainer

Arrows=direction of fuel flow

Engine starts but then dies (continued)

Fuel pressure O.K.?

Test specification:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

Pressure regulator O.K.?
Test specification reached?

no

Opel Rekord 2.0 l:

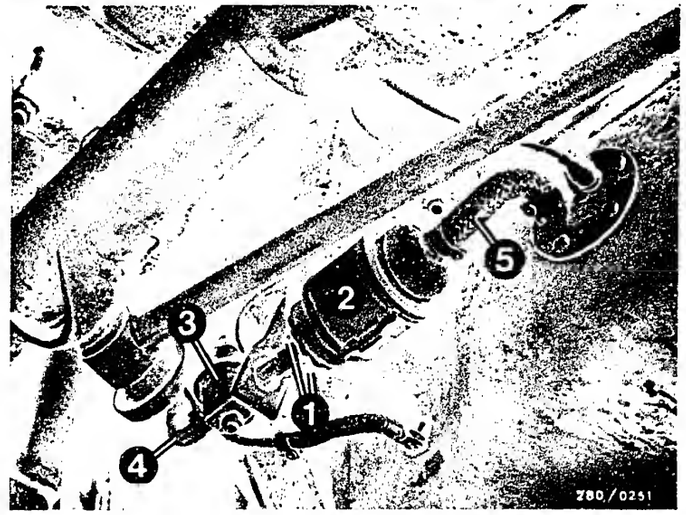
2. Check fuel delivery line and fuel filter for throughflow.
3. Strainer in tank clogged.
4. Corrosion in tank.

Fuel pressure of 2.7 bar or 3.2 bar exceeded:
1. Fuel return line clogged or pinched.
2. Replace pressure regulator.

Caution!
Jumper must be removed again after test is completed and the control relay must be fitted in position.

yes

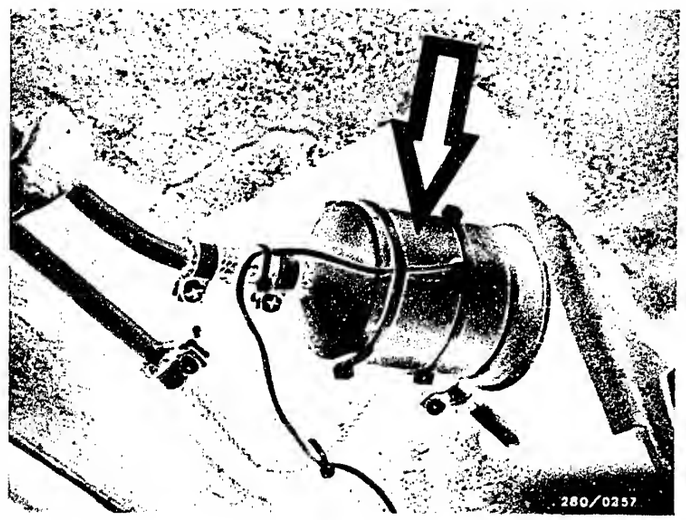
Continued on D23/D24



Arrangement of components in Opel Rekord

1=Electrical connections
2=Electric fuel pump
3=Fuel-line-pressure damper
4=Fuel delivery line
5=Fuel intake line

Arrow=fuel filter



Engine starts but then dies (continued)

Start valve O.K.?
(leak test)

no

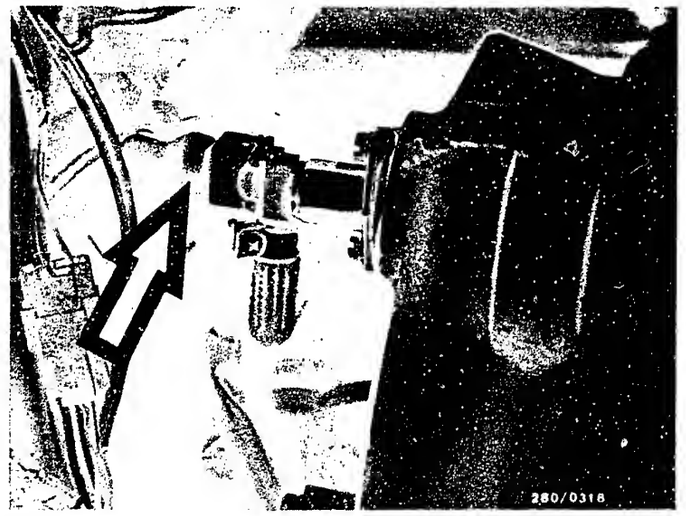
Testing the start valve for leaks

1. When installed:
Pinch off the fuel delivery line at the start valve. If engine then runs smoothly, replace start valve.
2. When removed:
Remove the start valve (caution! fire hazard!). Fuel lines and electric leads remain connected (place collector vessel under the start valve). Build up the fuel pressure (remove control relay and fit jumper into connection base between term. 87b and term. 30).
Caution!
The jumper must be removed again after test is completed and the control relay must be fitted in position.

Test specification: Within one minute max. 1 drop may form at the mouth of the valve.

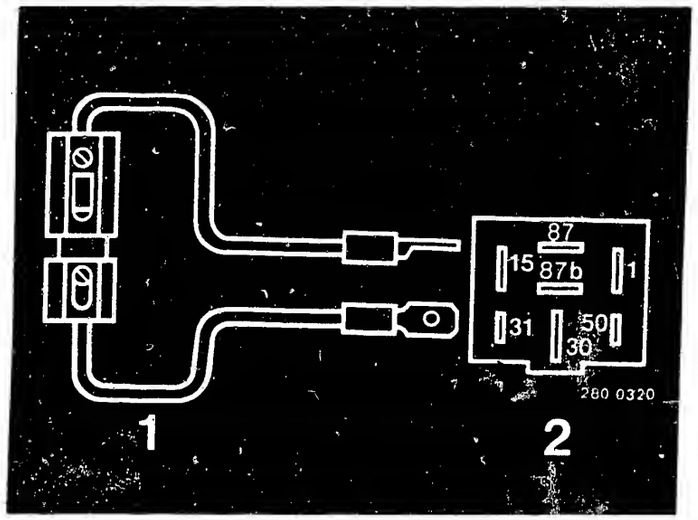
yes

Continued on E1/E2



Arrow=start valve

Jumper (user-fabricated)
1=Fuse holder with 10 A fuse
2=Top view of connection base



Engine starts but then dies (continued)

Auxiliary-air device tested?
(mechanically O.K.?)

no →

Testing:
1. Visual examination of auxiliary-air device:
Remove hoses and look down, using a small mirror if necessary. When cold, the device must be open; when the engine is warm, it must be closed. If not, replace auxiliary-air device.

2. Functional test of auxiliary-air device:
With the engine cold, pinch off hose to auxiliary-air device. Engine speed must drop. With the engine warm, pinch off hose to auxiliary-air device. Engine speed must not drop. If incorrect, replace auxiliary-air device (pay attention to direction of flow).

yes ↓

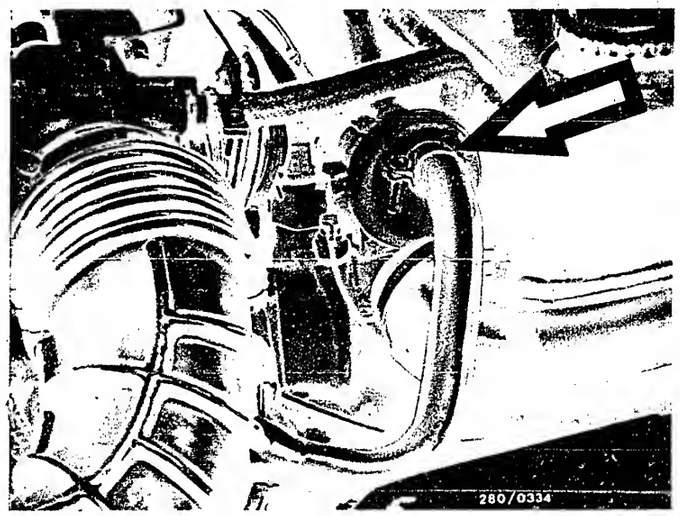
Auxiliary-air device tested?
(continued)
Electrically O.K.?

no →

Remove plug from auxiliary-air device. Connect ohmmeter to both terminals of auxiliary-air device:
Test specification: 35...70 Ω.
If the reading is outside tolerance, replace auxiliary-air device.

yes ↓

Continued on E3/E4



Arrow=auxiliary-air device

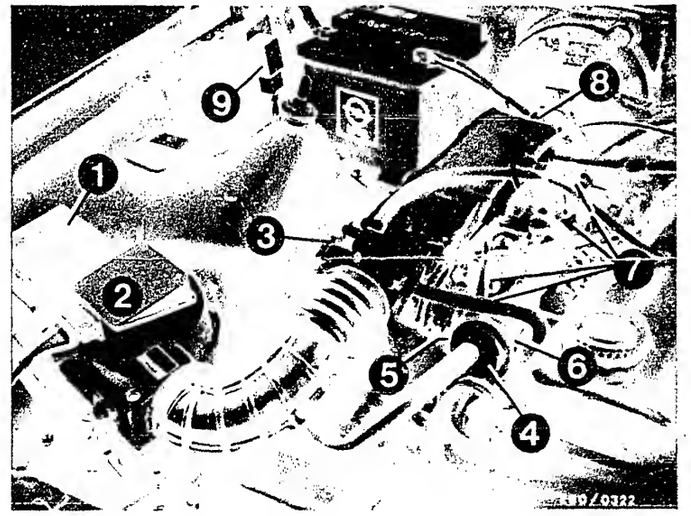
Engine starts but then dies (continued)

Are all hose lines and electric leads securely attached? visual examination.
Is the air-intake system leak-tight?

no → Check whether hoses of air-intake system and of fuel line system are securely attached, not kinked or damaged. If necessary, replace hoses. Eliminate leaks with new seals or by re-tightening the connecting screws.
Checking for leaks:
Seal off exhaust tail pipe. Screw off hose from air filter to air-flow sensor on air-flow sensor and seal off air-flow sensor duct. Pull off hose after auxiliary-air device and blow air (0.3 bar gauge pressure) into the intake manifold with a compressed-air gun. Seal off connection port on auxiliary-air device. Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Bubbling or foaming indicates a leak.
Check electric contacts for loose connection.

yes

Continued on E5/E6



1=Air filter
2=Air-flow sensor
3=Throttle-valve switch
4=Auxiliary-air device
5=Thermo-time switch
6=Temperature sensor II (water)
7=Solenoid-op. injection valves
8=Start valve
9=Control relay

Engine starts but then dies (continued)

Testing completed for customer complaint.

"Engine starts but then dies"

Customer complaint remedied?

no

Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates B 3...B 8). If the fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinate B3/B4).
- Engine not mechanically O.K. (compression, valve setting, valve timing, worn camshaft).

Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

The program is divided into 3 rows of boxes:
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If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.

Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment

yes

Ignition, engine etc. O.K.? — no → Remedy fault in ignition and engine.

yes

Test with universal adapter already performed? — no → For testing see Coordinates B 9 ... C 7

yes

Continued on E9/E10

Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (continued)

Throttle valve closed?

no

Testing:
Throttle valve closed?
Check whether the throttle valve can be closed still further and whether the engine speed thereby drops.

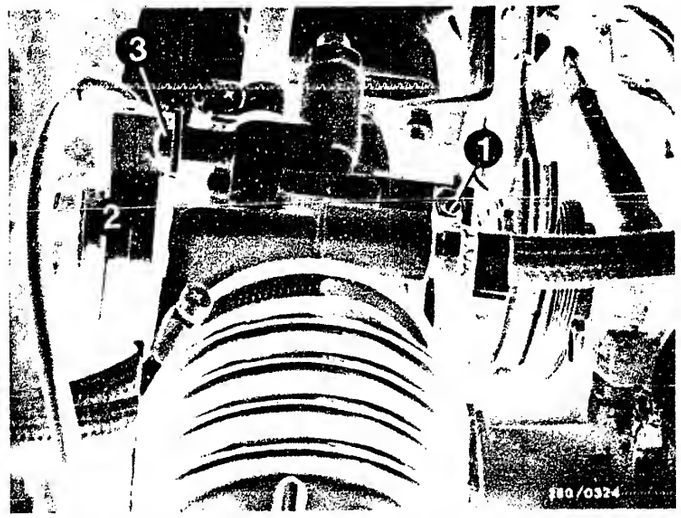
Adjustment:
The throttle valve must be set to just before it sticks with the throttle-valve stop screw.
Turn 1/4 to max. 1/2 turn in opposite direction.

Adjusting the throttle-valve switch:
Slightly loosen the throttle-valve switch fastening screws and turn the throttle-valve switch in an anti-clockwise direction until idle contact (microswitch) is heard to click.

Checking the adjustment:
Pull slightly on the throttle cable. The idle contact (microswitch) must be heard to click.

yes

Continued on E11/E12



1=Throttle-valve stop screw
2=Throttle-valve switch
3=Fastening screws

Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (continued)

CO and engine speed correctly adjusted?

no

CO and idle adjustment

Exhaust-gas test with CO analyzer with engine at normal operating temperature and at idle speed.

Idle speed

Manually-shifted transmission:	850...900 min^{-1}
Automatic transmission (selector lever in position "P"):	850...900 min^{-1}
CO setting:	max. 1.0% by vol.CO

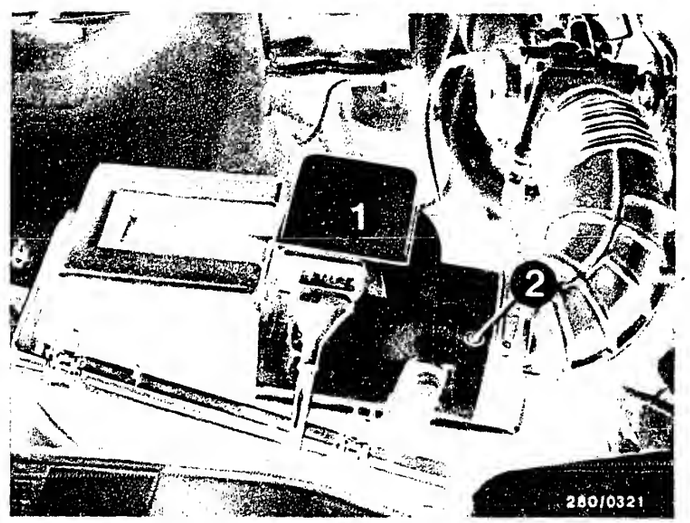
Let warmed-up engine idle with the air conditioner (if fitted) switched off.
Apply battery voltage to the solenoid-operated air valve. Engine speed is increased by approx. 150 min^{-1}. If there is no change in engine speed, replace the solenoid-operated air valve.

yes

Can engine speed not be adjusted?

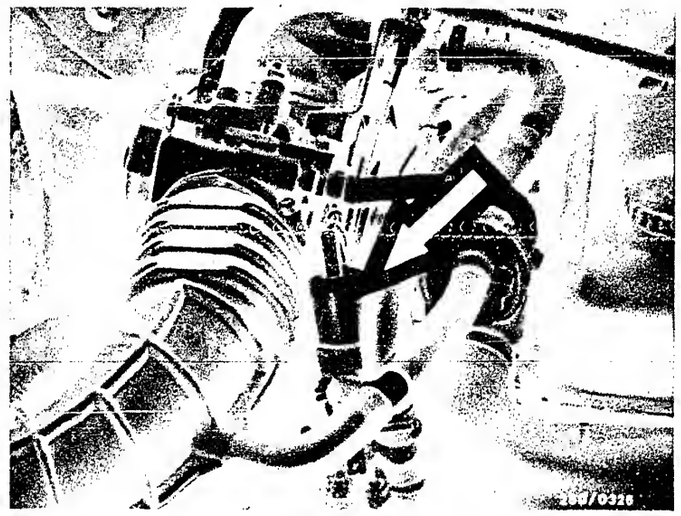
yes

Continued on E13/E14



1=CO adjusting screw
2=Idle-speed-adjusting screw

Arrow=solenoid-operated air valve



Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (continued)

CO and engine speed correctly adjusted?

no → If CO concentration too high, turn bypass screw (CO adjusting screw) in air-flow sensor half a turn in a counterclockwise direction. Check engine speed and CO concentration. Carry out adjustments in several steps. After adjusting, use new plugs.

yes

Can engine speed not be adjusted?

yes

Auxiliary-air device tested? (mechanically O.K.?)

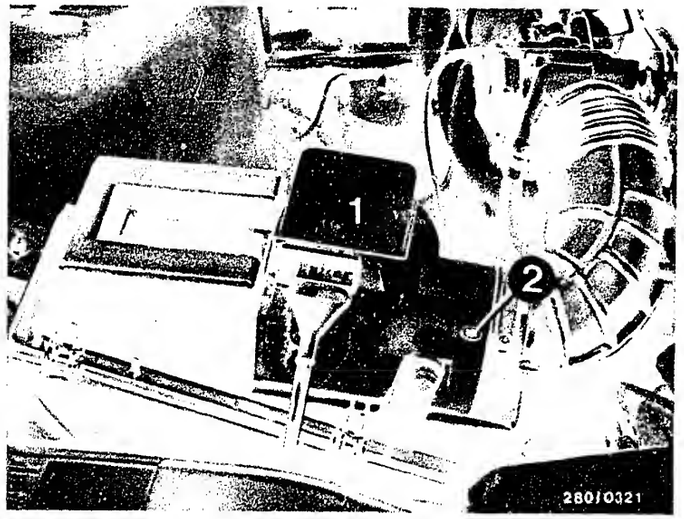
no → Testing:

1. Visual examination of auxiliary-air device:
When cold, the device must be open; when the engine is warm, it must be closed. If not, replace auxiliary-air device (remove hoses and look down, using a small mirror if necessary).

2. Functional test of auxiliary-air device:
With the engine cold, pinch off hose to auxiliary-air device. Engine speed must drop. With the engine warm, pinch off hose to auxiliary-air device. Engine speed must not drop. If incorrect, replace auxiliary-air device (pay attention to direction of flow).

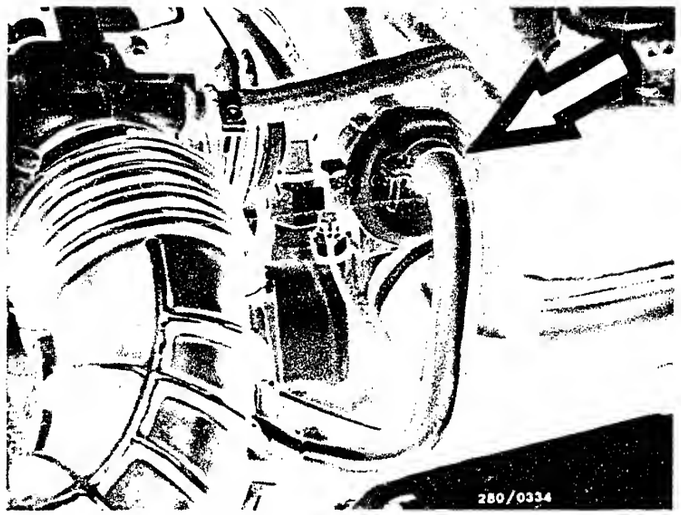
yes

Continued on E15/E16



1=CO adjusting screw
2=Idle-speed-adjusting screw

Arrow=auxiliary-air device



Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (continued)

Start valve O.K.?

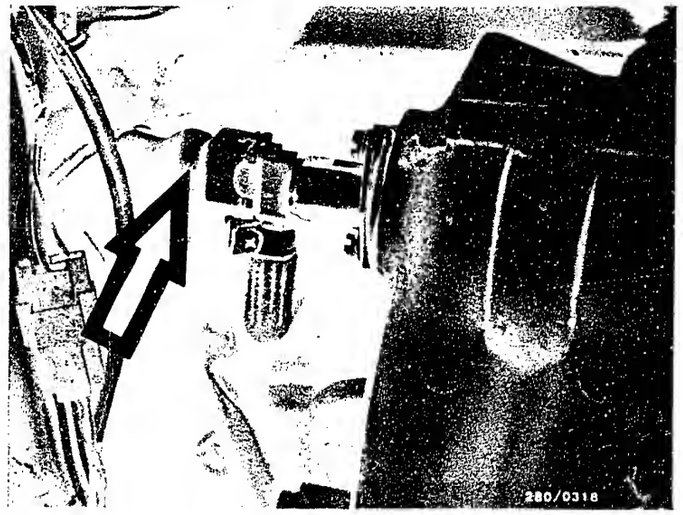
yes

no

Functional test: Check the power supply to the start valve when starting. To do this, remove the plug from the start valve and connect voltmeter to term. 30 and term. 29/term. 4 of the start valve plug.
1. Coolant temperature at ambient temperature (+15°C...+30°C): voltage reading min. 6 V.
2. Coolant temperature at engine temp.(appox.+80°C) Voltage reading approx. 0 V.
Test the following leads for continuity using ohmmeter (set value approx. 0 Ω):
Lead from term. 30 to thermo-time switch term. W.
Lead from term. 29 to thermo-time switch term. G.
Lead from term. 4 to control relay term. 50. Check ground connection of thermo-time switch.
Electrical test of start valve:
Connect ohmmeter to start valve term. 29 and term. 30: set value approx. 4 Ω.

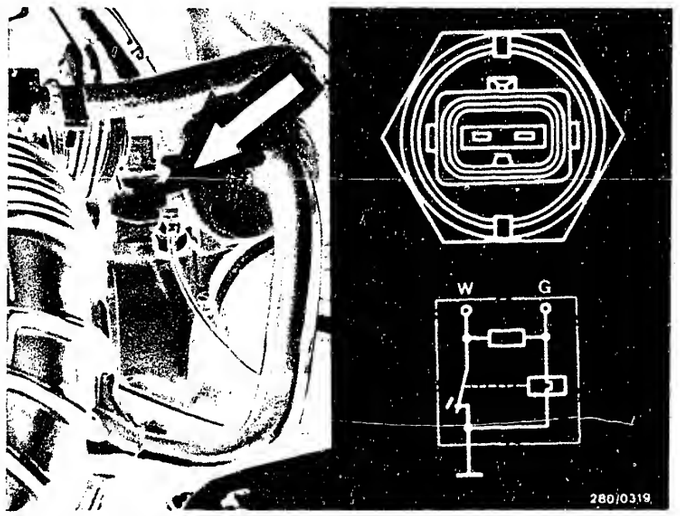
Mechanical test of start valve:
Remove start valve from intake manifold and hold in a container. (Caution! fire hazard!). When starting and at ambient temp.(+15°..+30°C)the start valve must squirt (max. 8 secs.). At engine temp. ((+80°C) the start valve must not squirt. With the ignition switched on and the pressure built up,the start valve must likewise not squirt.

Continued on E17/E18



Arrow=start valve

Arrow=thermo-time switch



Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (continued)

Start valve O.K.? (continued)

no →

Carry out squirt test at engine temperature (+80°C) as follows: Remove plug from thermo-time switch and ground term. W.

Testing the start valve for leaks

1. When installed:

Pinch off the fuel delivery line at the start valve. If engine then runs smoothly, replace start valve.

2. When removed:

Remove the start valve (caution! fire hazard!). Fuel lines and electric leads remain connected (place collector vessel under the start valve). Build up the fuel pressure (remove control relay and fit jumper into connection base between term. 87b and term. 30).

Caution!

The jumper must be removed again after test is completed and the control relay must be fitted in position.

Test specification: Within one minute max. 1 drop may form at the mouth of the valve.

yes ↓

Thermo-time switch O.K.?

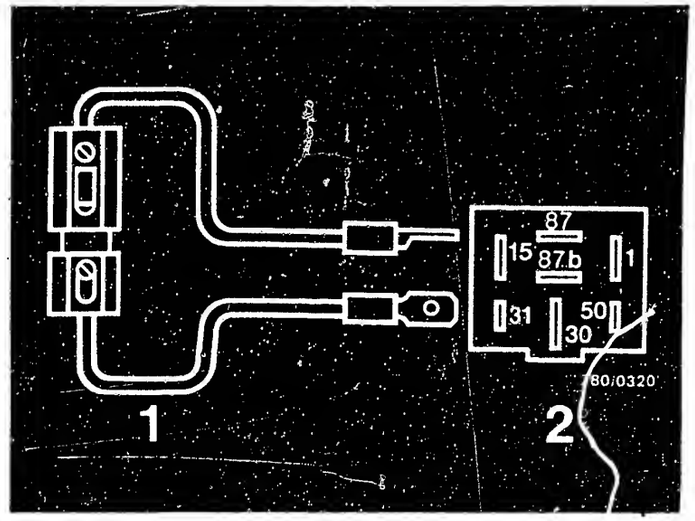
no →

Electrical test:

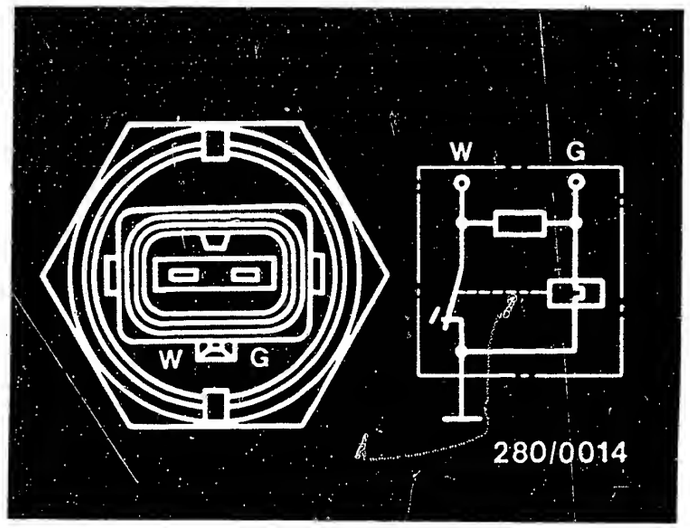
Test the thermo-time switch 35°C/8 sec. as follows: Remove the plug and measure resistance directly at thermo-time switch with ohmmeter.

yes ↓

Continued on E19/E20



Jumper (user-fabricated)
1=Fuse holder with 10 A fuse
2=Top view of connection base



Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (continued)

Thermo time switch O.K.? (continued)

no →

1. Between term. "G" and ground at ambient temperature (below +30°C): 25...40 Ω
at engine temperature (above +40°C): 50...80 Ω
2. Between term. "W" and ground at ambient temperature (below +30°C): 0 Ω
at engine temperature (above +40°C): 100..160Ω
3. Between term. "G" and ground at ambient temperature (below +30°C): 25...40Ω
at engine temperature (above +40°C): 50...80Ω

yes ↓

Fuel pressure O.K.?

Test specification:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

Test specification reached?

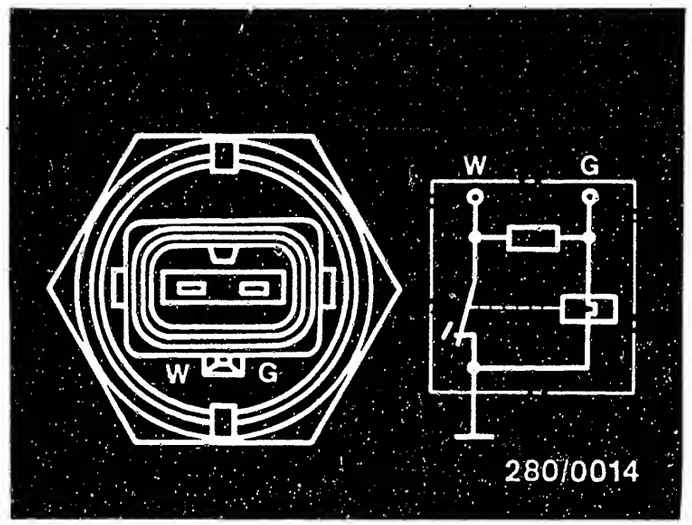
no →

Testing the fuel pressure
Connect the connections of the pressure testers into the fuel delivery line. If using pressure tester KDJE-P 100, close the hollow screw when testing the L-Jetronic.

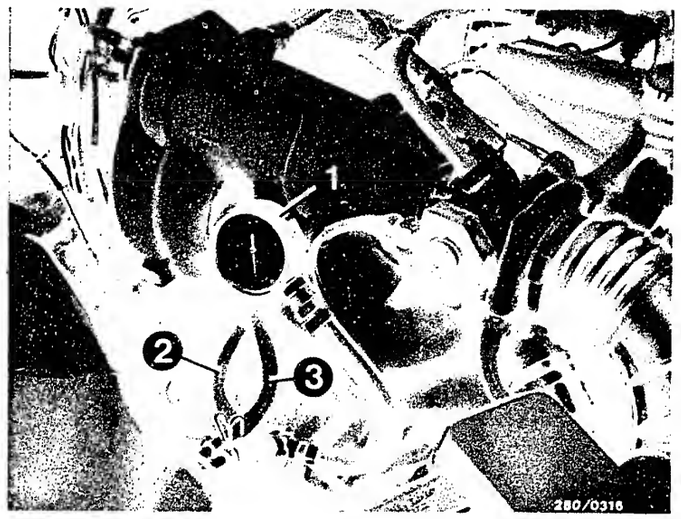
Caution!
When removing the fuel hose make sure that no fuel gets onto hot parts of the engine.

yes ↓

Continued on E21/E22



1=Pressure gauge (pressure tester 1 687 231 154)
2=Fuel delivery line
3=Fuel return line



Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (continued)

Fuel pressure O.K.?

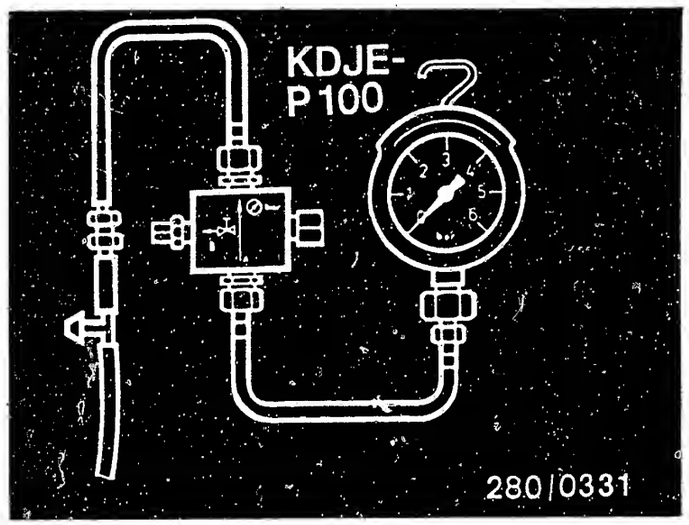
Test specification:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

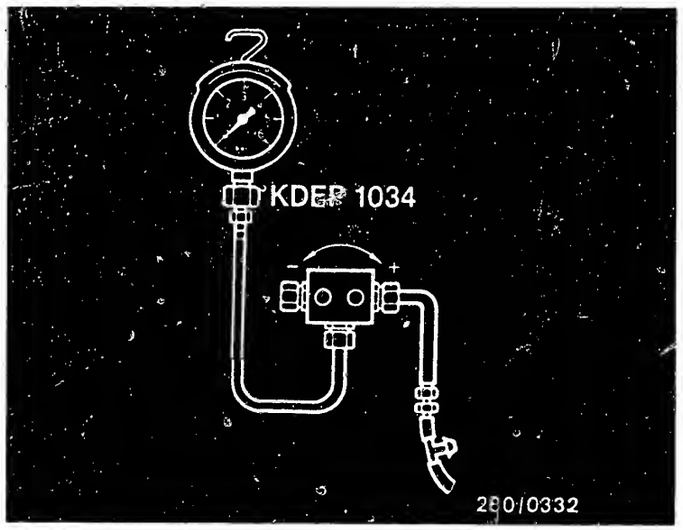
Test specification reached?

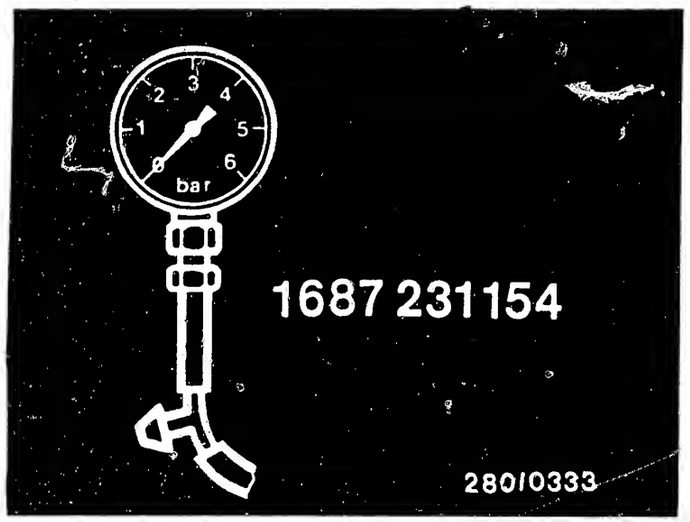
no → Unscrew fuel delivery line (at junction on wheel box on right-hand side).
Plug the Y-piece of the pressure tester onto the hose to the fuel-distribution pipe. Plug the hose of the pressure tester onto the fuel delivery line.
Make sure there are no leaks

yes

Continued on E23/E24







Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (continued)

Fuel pressure O.K.?

Test specification:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

Pressure regulator O.K.?
Test specification reached?

no →

Remove the control relay. Fit a jumper into the connection base between term. 87b and term. 30.
Fuel pump must operate
Fuel pump pressure:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar
Caution!
Remove the jumper and fit the control relay in position. Let the engine idle → fuel pump pressure approx. 2.0 bar

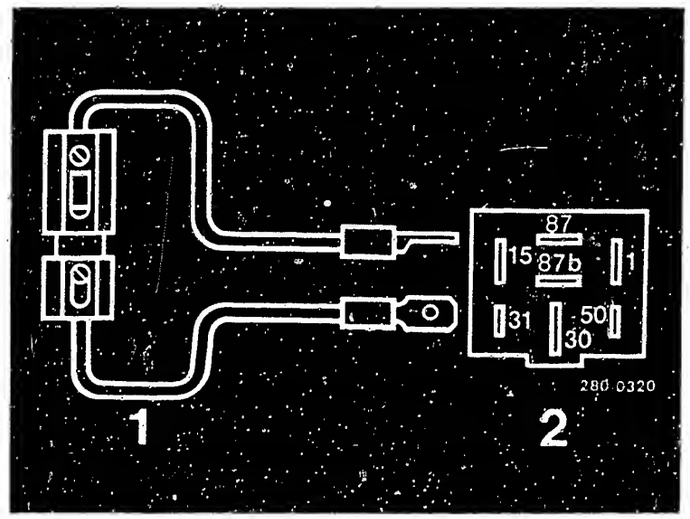
Testing the pressure regulator
Remove the control relay and fit a jumper into the connection base between term. 87b and term. 30.
Electric fuel pump must operate.
Fuel pump pressure:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

Fuel pressure of 2.3 bar or 2.8 bar not reached:
1. Slowly pinch off fuel return line: (caution: do not load pressure gauge above 6 bar).

Pressure rises above 4 bar → replace pressure regulator.
Pressure remains below 4 bar → replace fuel pump.

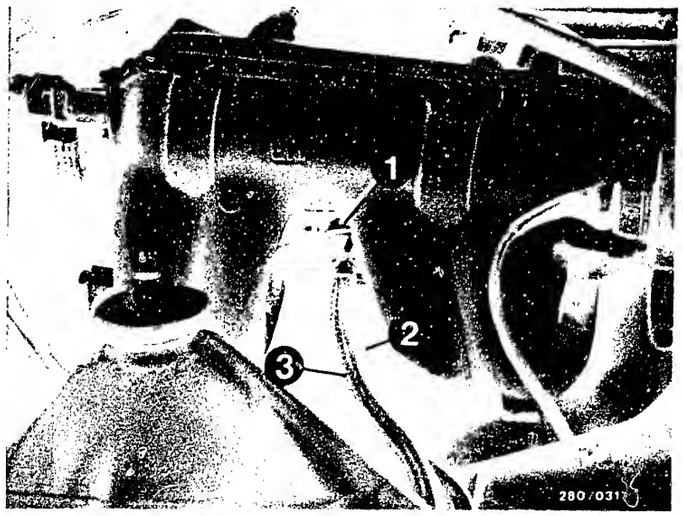
yes

Continued on F1/F2



Jumper (user-fabricated)
1=Fuse holder with 10 A fuse
2=Top view of connection base

1=Pressure regulator
2=Fuel delivery line
3=Fuel return line



Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (continued)

Fuel pressure O.K.?

Test specification:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

Pressure regulator O.K.?
Test specification reached?

no →

Opel Manta 2.0 l:

2. Check fuel delivery line and fuel filter for throughflow.
3. Strainer in tank clogged.
4. Corrosion in tank.

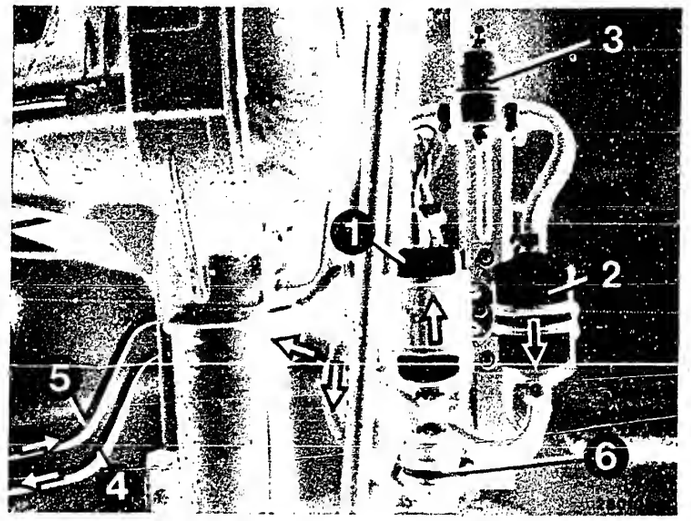
Fuel pressure of 2.7 bar or 3.2 bar exceeded:

1. Fuel return line clogged or pinched.
2. Replace pressure regulator.

Caution!
Jumper must be removed again after test is completed, and the control relay must be fitted in position.

yes ↓

Continued on F3/F4



Arrangement of components in Opel Manta
1=Electric fuel pump
2=Fuel filter
3=Fuel-line-pressure damper
4=Fuel delivery line
5=Fuel return line
6=Fuel strainer

Arrows=direction of fuel flow

Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (continued)

Fuel pressure O.K.?

Test specification:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

Pressure regulator O.K.?
Test specification reached?

no →

Opel Rekord 2.0 l:

2. Check fuel delivery line and fuel filter for throughflow.
3. Strainer in tank clogged.
4. Corrosion in tank.

Fuel pressure of 2.7 bar or 3.2 bar exceeded:
1. Fuel return line clogged or pinched.
2. Replace pressure regulator.

Caution!
Jumper must be removed again after test is completed and the control relay must be fitted in position.

yes ↓

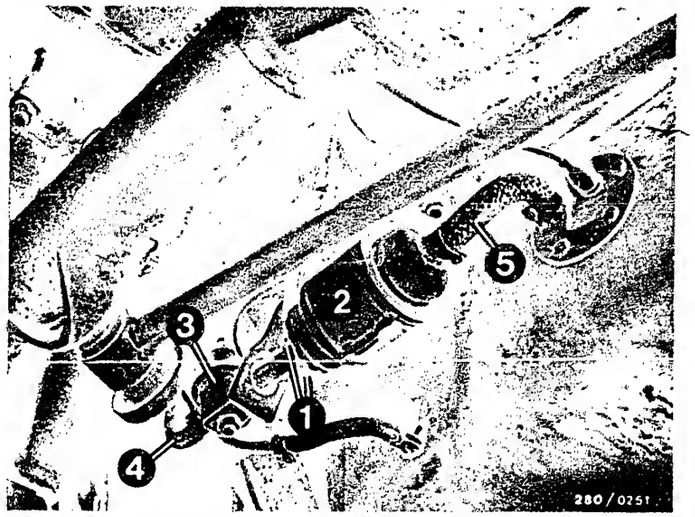
Vacuum limiter (Sweden version only) O.K.?

no →

Let the engine idle. Pinch off the connecting hose before or after the vacuum limiter. Change in engine speed?
If yes, replace vacuum limiter.
If not, pull off connecting hose before throttle valve and seal off connection port at throttle valve. Briefly accelerate engine - engine speed approx. 3500 min^{-1}. When releasing the throttle, test the vacuum hose with your finger to see whether air is being sucked in.
If not, replace vacuum limiter.

yes ↓

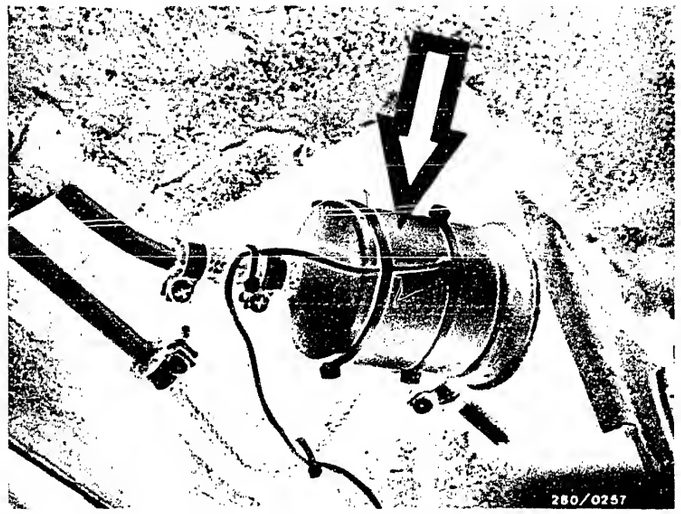
Continued on F5/F6



Arrangement of components in Opel Rekord

1=Electrical connections
2=Electric fuel pump
3=Fuel-line-pressure damper
4=Fuel delivery line
5=Fuel intake line

Arrow=fuel filter



Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (continued)

Solenoid-operated injection valve mechanically O.K.?

no → With the engine running, disconnect the injection valve connectors individually, one after the other, from the injection valves and plug on again. Engine speed must drop if injection valve is O.K.. Using ohmmeter, test for continuity in the connecting leads from control relay term. 87 to the individual injection valves and from the injection valves to the multiple plug term. 12. Set value approx. 0 Ω. Resistance of the individual injection valves: 15.0... 20 Ω. Caution! when replacing the injection valves, install only solenoid-operated injection valve 0 280 150 205 (yellow plug part).

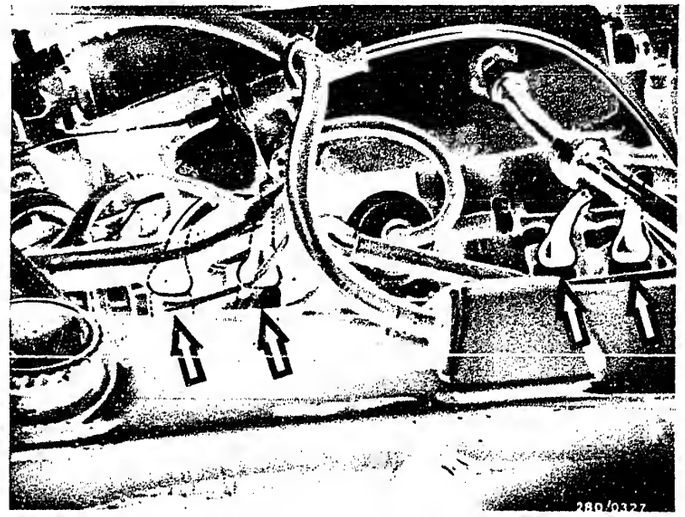
yes ↓

Air-flow sensor O.K.?

no → Testing:
Open air-flow sensor flap by hand. It must be possible to open the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. When the air-flow sensor flap is opened it must not catch at any point. Watch for any indications of abrasion or rubbing. Clean air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are any signs of abrasion or rubbing, replace the air-flow sensor. Connect ohmmeter to term. 8 and term. 9 of air-flow sensor. Test specification: 160...300 Ω. Connect ohmmeter to term. 7 and term. 5 of air-flow sensor. Deflect air-flow sensor flap. Test specification: 60...1000 Ω. Sensor flap must return to rest position. If not, the stopper or the sensor flap is bent. Replace air-flow sensor.

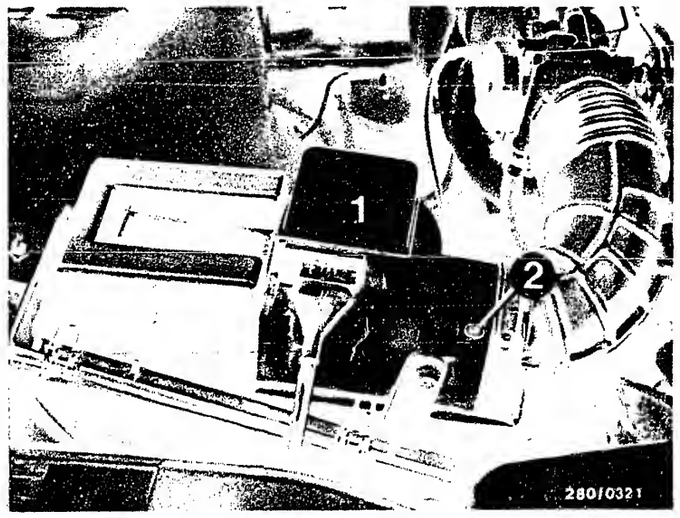
yes ↓

Continued on F7/F8



Arrows=solenoid-operated injection valves

1=Air-flow sensor
2=CO adjusting screw



Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (continued)

Are all hose lines and electric leads securely attached?
Visual examination.
Is the air-intake system leak-tight?

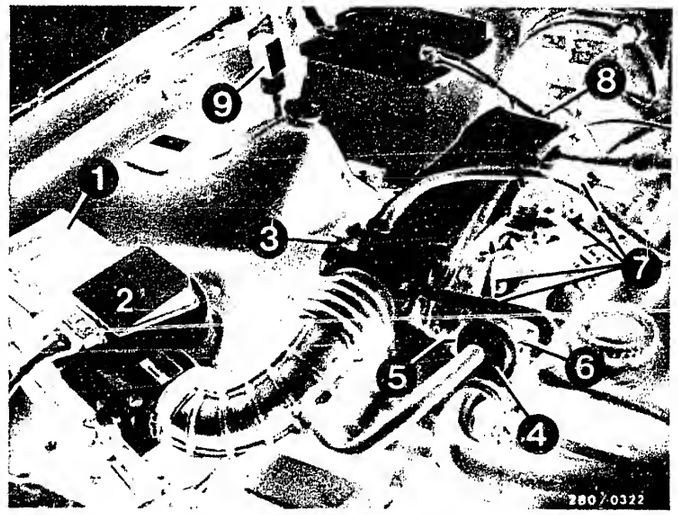
no →

Check whether hoses of air-intake system and of fuel line system are securely attached, not kinked or damaged. If necessary, replace hoses. Eliminate leaks with new seals or by re-tightening the connecting screws.

Checking for leaks:
Seal off exhaust tail pipe. Screw off hose from air filter to air-flow sensor on air-flow sensor and seal off air-flow sensor duct. Pull off hose after auxiliary-air device and blow air (0.3 bar gauge pressure) into the intake manifold with a compressed-air gun. Seal off connection port on auxiliary-air device. Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Bubbling or foaming indicates a leak.
Check electric contacts for loose connection.

yes

Continued on F9/F10



1=Air filter
2=Air-flow sensor
3=Throttle-valve switch
4=Auxiliary-air device
5=Thermo-time switch
6=Temperature sensor II (water)
7=Solenoid-op. injection valves
8=Start valve
9=Control relay

Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (continued)

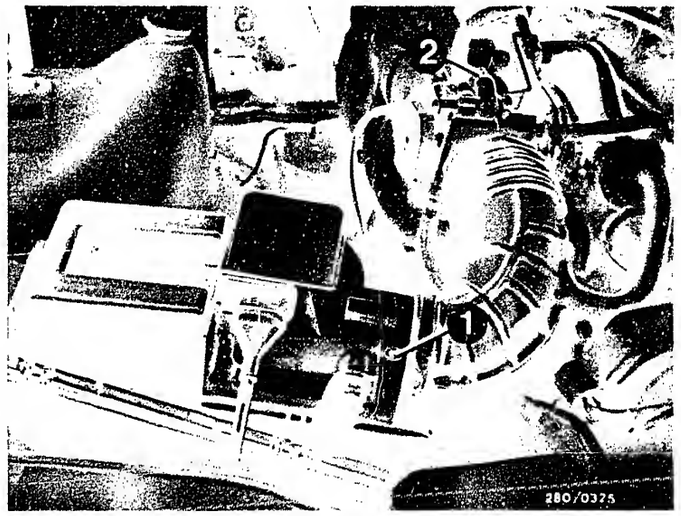
CO and engine speed correctly adjusted?
Repeat

no

CO and idle adjustment
Exhaust-gas test with CO analyzer with engine at normal operating temperature and at idle speed.
Idle speed:
Manually-shifted transmission: 850...900 min^{-1}
Automatic transmission (selector lever in position "P"): 850...900 min^{-1}
CO setting: max.1.0% by vol.CO
Let warmed-up engine idle with the air conditioner (if fitted) switched off. Apply battery voltage to the solenoid-operated air valve. Engine speed is increased by approx. 150 min^{-1}. If there is no change in engine speed, replace the solenoid-operated air valve.
If CO concentration too high, turn bypass screw (CO adjusting screw) in air-flow sensor half a turn in a counterclockwise direction. Check engine speed and CO concentration. Carry out adjustments in several steps. After adjusting, use new plugs.

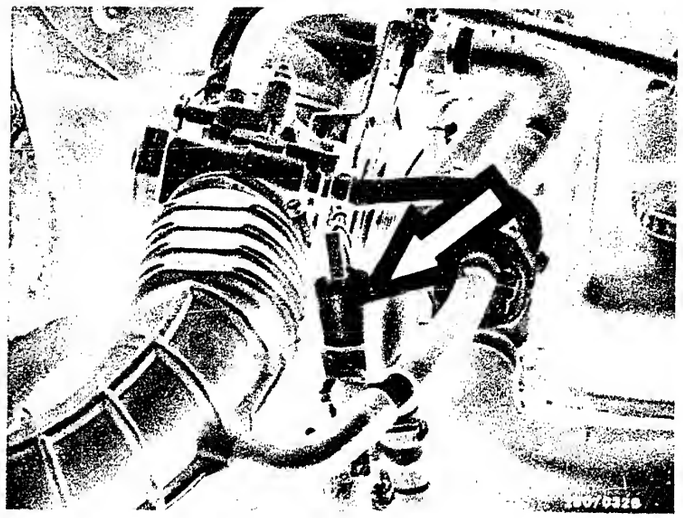
yes

Continued on F11/F12



1=CO adjusting screw
2=Idle-speed-adjusting screw

Arrow=solenoid-operated air valve



Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (continued)

Testing completed for customer complaint.

"Uneven engine idle"

Customer complaint remedied?

no

Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates B3...B8). If the fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinate B3/B4).
- Engine not mechanically O.K. (compression, valve setting, valve timing, worn camshaft).

Trouble-shooting program according to customer complaints

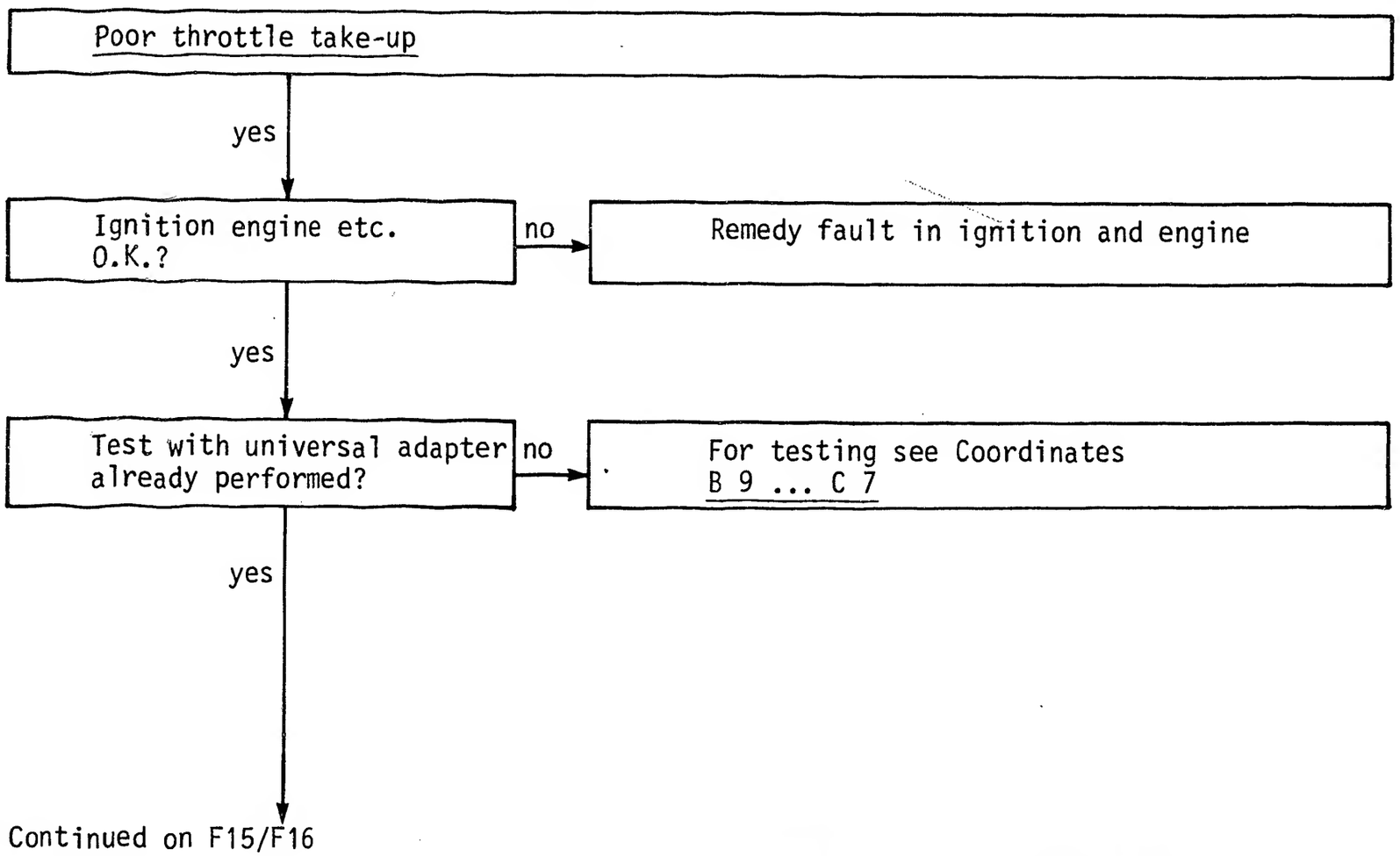
How to use the following trouble-shooting program

The program is divided into 3 rows of boxes:
1. The left-hand row contains the questions on the tests.
2. The middle row contains descriptions of the testing and adjustment operations on the components.
3. The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.



Poor throttle take-up (continued)

Throttle valve closed?

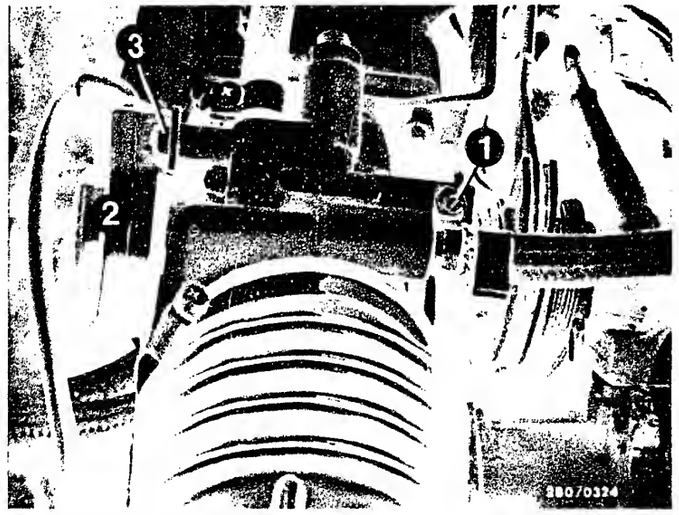
no

Testing:
Throttle valve closed?
Check whether the throttle valve can be closed still further and whether the engine speed thereby drops.
Adjustment:
The throttle valve must be set to just before it sticks with the throttle-valve stop screw.
Turn 1/4 to max. 1/2 turn in opposite direction.

Adjusting the throttle-valve switch:
Slightly loosen the throttle-valve switch fastening screws and turn the throttle-valve switch in an anti-clockwise direction until idle contact (microswitch) is heard to click.

Checking the adjustment:
Pull slightly on the throttle cable. The idle contact (microswitch) must be heard to click.

yes



1=Throttle-valve stop screw
2=Throttle-valve switch
3=Fastening screws

Continued on F17/F18

Poor throttle take-up (continued)

Auxiliary-air device tested? (mechanically O.K.?)

no

Testing:

1. Visual examination of auxiliary-air device:
When cold, the device must be open; when the engine is warm, it must be closed. If not, replace auxiliary-air device (remove hoses and look down, using a small mirror if necessary).
2. Functional test of auxiliary-air device:
With the engine cold, pinch off hose to auxiliary-air device. Engine speed must drop. With the engine warm, pinch off hose to auxiliary-air device. Engine speed must not drop. If incorrect, replace auxiliary-air device (pay attention to direction of flow).

yes

Auxiliary-air device tested? (continued) Electrically O.K.?

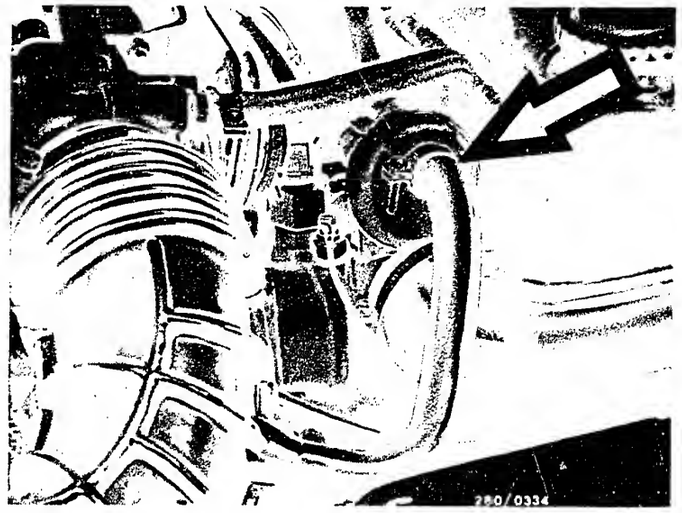
no

Remove connector from auxiliary-air device.
Connect ohmmeter to both terminals of auxiliary-air device:
Test specification: 35...70 Ω.

If the reading is outside tolerance, replace the auxiliary-air device.

yes

Continued on F19/F20



Arrow=auxiliary-air device

Poor throttle take-up (continued)

Air-flow sensor O.K.?

no

Testing: Open air-flow sensor flap by hand. It must be possible to open the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. When the air-flow sensor flap is opened it must not catch at any point. Watch for any indications of abrasion or rubbing. Clean air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are any signs of abrasion or rubbing, replace the air-flow sensor. Connect ohmmeter to term. 8 and term. 9 of air-flow sensor. Test specification: 160...300 Ω. Connect ohmmeter to term. 7 and term. 5 of air-flow sensor. Deflect air-flow sensor flap. Test specification: 60... 1000 Ω. Sensor flap must return to rest position. If not, the stopper or the sensor flap is bent. Replace air-flow sensor.

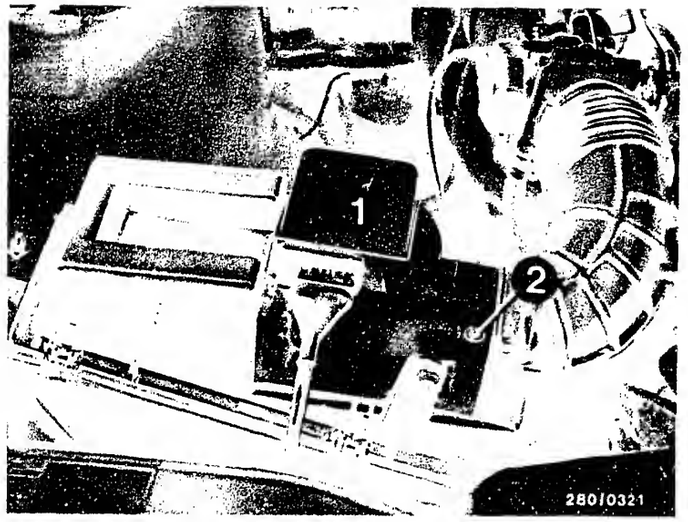
If engine missing: (noise test)

Remove air-flow sensor. Remove air filter by opening snap fasteners. Loosen fastening screws of air-flow sensor. Leave connectors on. Set motortester to special input and connect using special cable to air-flow sensor term. 7 (red clip) and term. 5 (black clip). Set control stick for image adjustment on motortester as far as it will go to the left (calibrated setting). Deflect air-flow sensor flap suddenly several times. The oscilloscope must show a continuous signal. If incorrect (see illustration) → replace air-flow sensor.

Pull off control relay, connect jumper to connection socket between terminals 87 and 30. (voltage supply for trigger box),

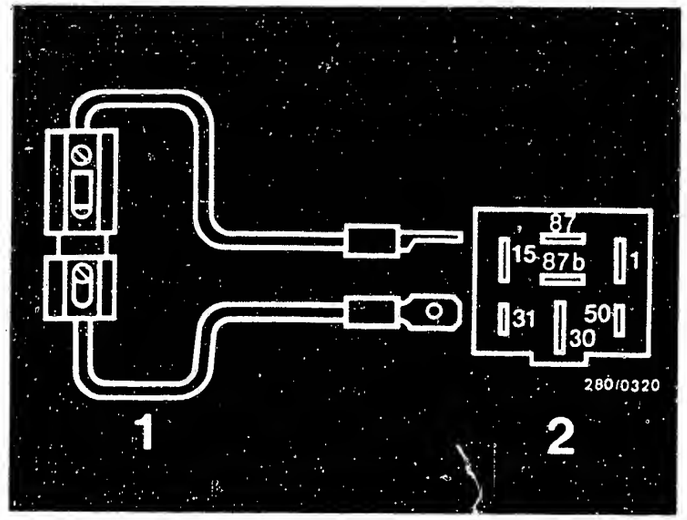
yes

Continued on F21/F22



1=Air-flow sensor
2=CO adjusting screw

Jumper (user-fabricated)
1 = Fuse holder with 10 A fuse
2 = Top view of connection base



Poor throttle take-up (continued)

Air-flow sensor O.K.?

no → Deflect air-flow sensor flap suddenly several times. The oscilloscope must show a continuous signal. If incorrect (see illustration) replace air-flow sensor.
Note:
Jumper must be removed when test is terminated and control relay must be connected.

yes ↓

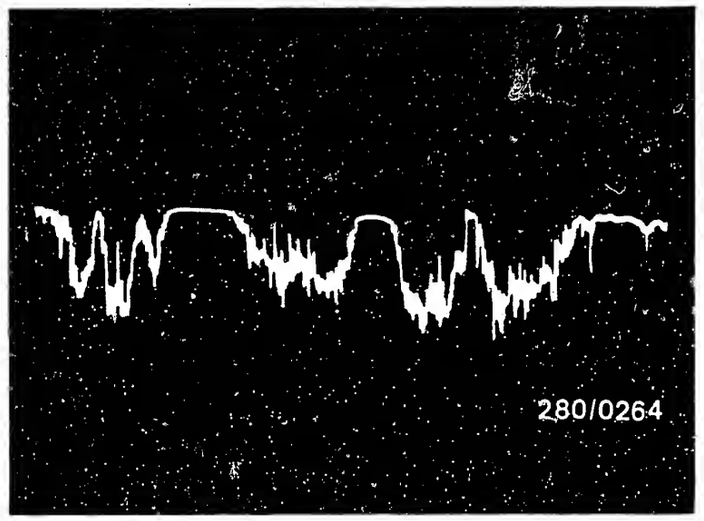
Are all hose lines and electric leads securely attached?
Visual examination.
Is the air-intake system leak-tight?

no → Check whether hoses of air-intake system and of fuel line system are securely attached, not kinked or damaged. If necessary, replace hoses. Eliminate leaks with new seals or by re-tightening the connecting screws.

Checking for leaks:
Seal off exhaust tail pipe. Screw off hose from air filter to air-flow sensor on air-flow sensor and seal off air-flow sensor duct. Pull off hose after auxiliary-air device and blow air (0.3 bar gauge pressure) into the intake manifold with a compressed-air gun. Seal off connection port on auxiliary-air device. Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Bubbling or foaming indicates a leak.
Check electric contacts for loose connection.

yes ↓

Continued on F23/F24



1=Air filter
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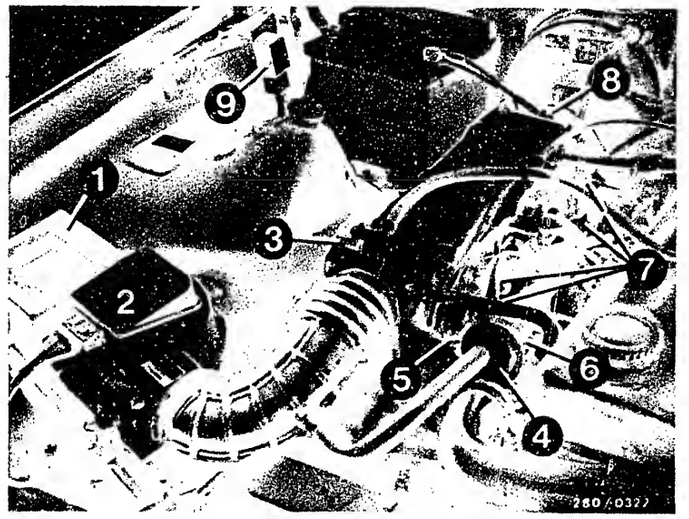
8=Start valve
9=Control relay



Poor throttle take-up (continued)

CO and engine speed correctly adjusted?

no

CO and idle adjustment

Exhaust-gas test with CO analyzer with engine at normal operating temperature and at idle speed.

Idle speed:

Manually-shifted transmission: 850...900 min^{-1}

Automatic transmission (selector lever in position "P"): 850...900 min^{-1}

CO setting: max.1.0% by vol.CO

Let warmed-up engine idle with the air conditioner (if fitted) switched off. Apply battery voltage to the solenoid-operated air valve. Engine speed is increased by approx. 150 min^{-1}. If there is no change in engine speed, replace the solenoid-operated air valve.

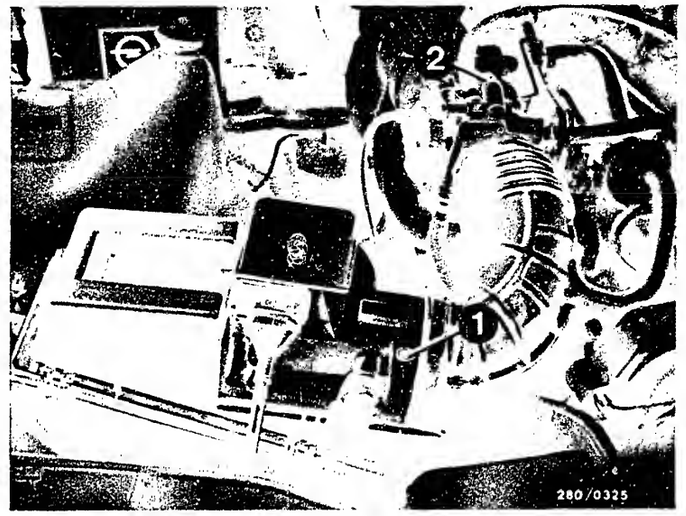
If CO concentration too high, turn bypass screw (CO adjusting screw) in air-flow sensor half a turn in a counterclockwise direction. Check engine speed and CO concentration. Carry out adjustments in several steps. After adjusting, use new plugs.

yes

Can engine speed not be adjusted?

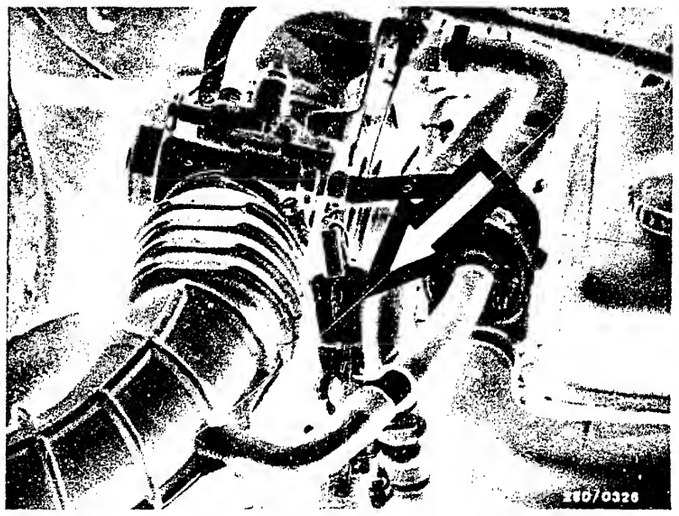
yes

Continued on G1/G2



1=CO adjusting screw
2=Idle-speed-adjusting screw

Arrow=solenoid-operated air valve



Poor throttle take-up (continued)

Testing completed for customer complaint.

"Poor throttle take-up"

Customer complaint remedied?

no

Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates B3...B8). If the fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinate B3/B4).
- Engine not mechanically O.K. (compression, valve setting, valve timing, worn camshaft).

Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

The program is divided into 3 rows of boxes:
1. The left-hand row contains the questions on the tests.
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If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.

Engine missing under all operating conditions

yes

Ignition engine etc. O.K.? — no → **Remedy fault in ignition and engine**

yes

Test with universal adapter already performed? — no → **For testing see Coordinates B 9 ... C 7**

yes

Continued on G5/G6

Engine missing under all operating conditions (continued)

Plug-in connection of Jetronic wiring harness O.K.?
Loose contacts?

no → Check all plug-in connections for security and corrosion. Ensure a good ground connection.
(Terminals 5, 13, 26, 38, 40 and 56)

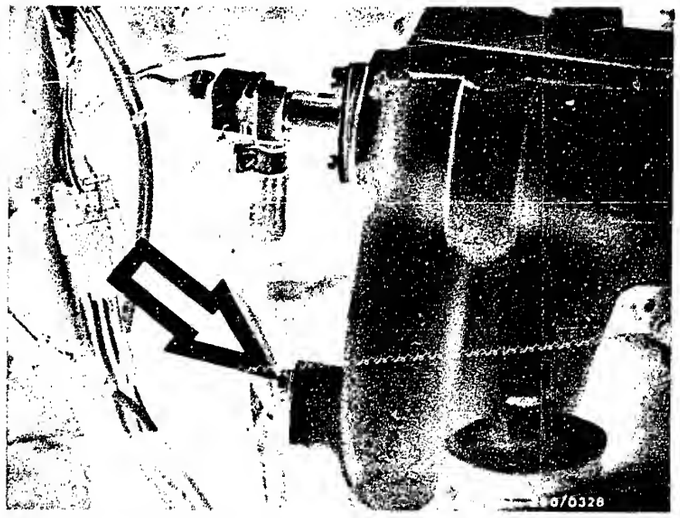
yes

Power supply to injection system O.K.?
Loose contacts?
Control relay O.K.?

no → Remove wiring-harness plugs from the control relay. Check whether all blade receptacles and leads are O.K.
Plug on control relay and turn round so that the connection base is accessible from below.
Test power supply.
Switch on ignition. Using voltmeter, measure battery voltage at term. 30 to vehicle ground.
Start engine. Using voltmeter, measure voltage to vehicle ground at term. 15 and term. 50, also term. 87 and 87b (set value 7...15 V). To test the voltage at term. 1 it is necessary to remove the control relay. (Set value 7...15 V to vehicle ground). If no voltage, test connecting leads and, if necessary, replace the control relay.
Test all connecting leads for continuity. Move the wiring harness when doing this. Suspicion of line breaks.

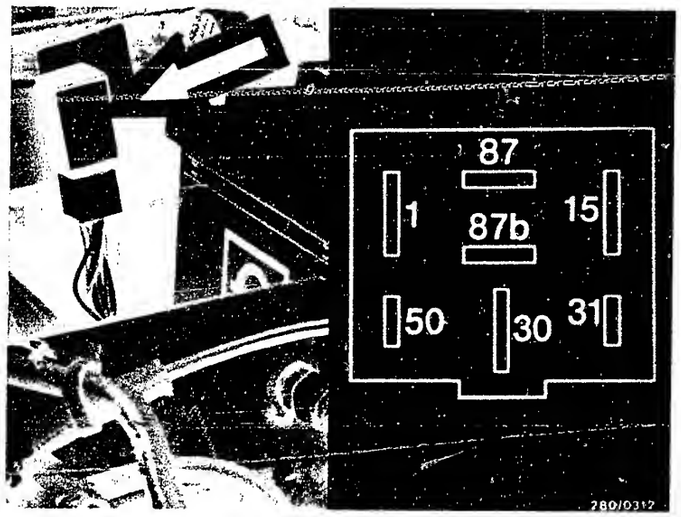
yes

Continued on G7/G8



Arrow=central ground terminal

Arrow=control relay connection base (viewed from below)



Engine missing under all operating conditions (continued)

Generator with regulator O.K.? (Engine missing due to voltage peaks).

no → With the engine switched off, remove the plug from the generator. Start the engine. If missing stops, test generator and regulator. Voltage peaks are visible on the ignition oscilloscope.

yes

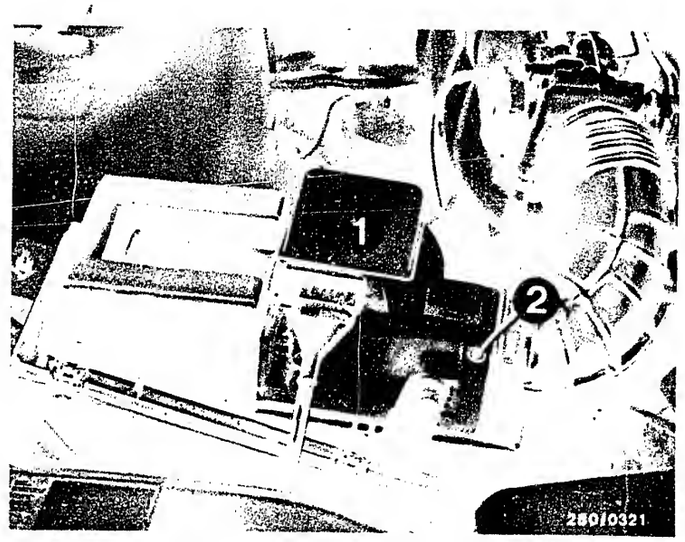
Air-flow sensor O.K.?

no → Testing: Open air-flow sensor flap by hand. It must be possible to open the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. When the air-flow sensor flap is opened it must not catch at any point. Watch for any indications of abrasion or rubbing. Clean air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are any signs of abrasion or rubbing, replace the air-flow sensor. Connect ohmmeter to term. 8 and term. 9 of air-flow sensor. Test specification: 160...300 Ω. Connect ohmmeter to term. 7 and term. 5 of air-flow sensor. Deflect air-flow sensor flap. Test specification: 60... 1000 Ω. Sensor flap must return to rest position. If not, the stopper or the sensor flap is bent. Replace air-flow sensor.

yes

Continued on G9/G10

1 = Air-flow sensor



Engine missing under all operating conditions (continued)

Air-flow sensor O.K.?

no

If engine missing: (noise test)
Remove air-flow sensor. Remove air filter by opening snap fasteners. Loosen fastening screws of air-flow sensor. Leave connectors on. Set motortester to special input and connect using special cable to air-flow sensor term. 7 (red clip) and term. 5 (black clip). Set control stick for image adjustment on motortester as far as it will go to the left (calibrated setting).

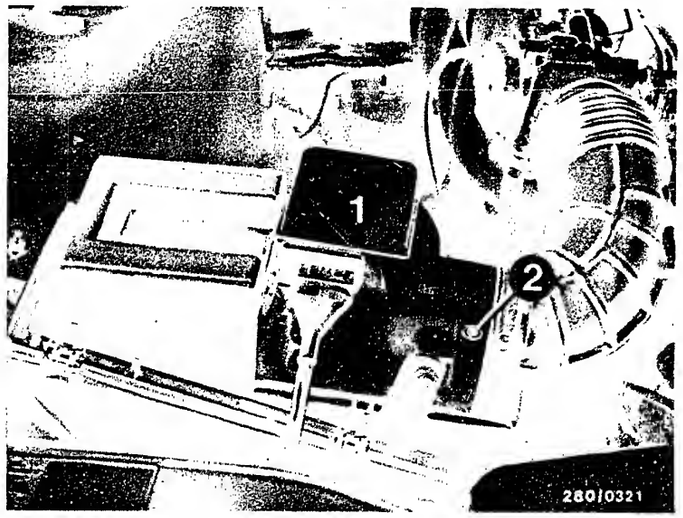
Pull off control relay, connect jumper to connection socket between terminal 87 and terminal 30 (voltage supply for control unit).

Deflect air-flow sensor flap suddenly several times. The oscilloscope must show a continuous signal. If incorrect (see illustration) replace air-flow sensor.

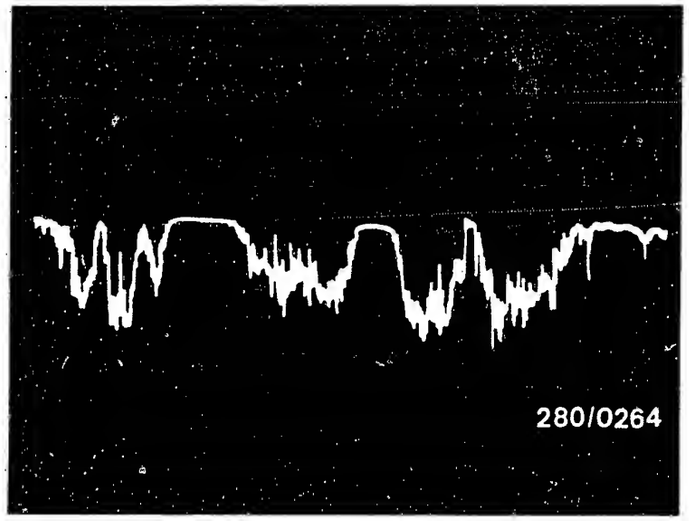
Note:
Jumper must be removed when test is terminated and control relay must be connected.

yes

Continued on G11/G12



1=Air-flow sensor
2=CO adjusting screw



Engine missing under all operating conditions (continued)

Fuel delivery O.K.? — no →

Measuring the fuel delivery:
For testing, undo the junction between the fuel return hose (from pressure regulator) and fuel return line (to fuel tank). If necessary, extend hose and lead into a 5 l vessel with graduated scale.
Remove the control relay and fit a jumper into the connection base between term. 87b and term. 30.
Fuel pump must operate.
Caution! Be sure to remove the jumper after you have finished testing.
Test specification: min. 700 cm³/30s
Remedy if test specification not reached:
- Fuel filter clogged → replace
- Voltage at fuel pump plugs, with engine running min. 12V → clean contacts; possibly also eliminate poor ground connection; replace leads.
- Fuel pressure regulator defective → replace
- Fuel pump delivery too low → replace fuel pump.

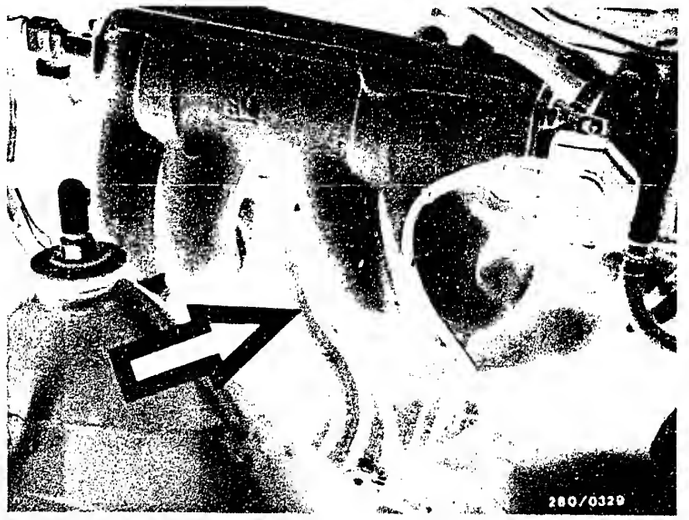
yes ↓

Control unit O.K.? — no →

Let engine run. Shake control unit lightly and move multiple plug. Watch for engine missing. Restore plug-in connection on multiple plug or replace defective control unit.

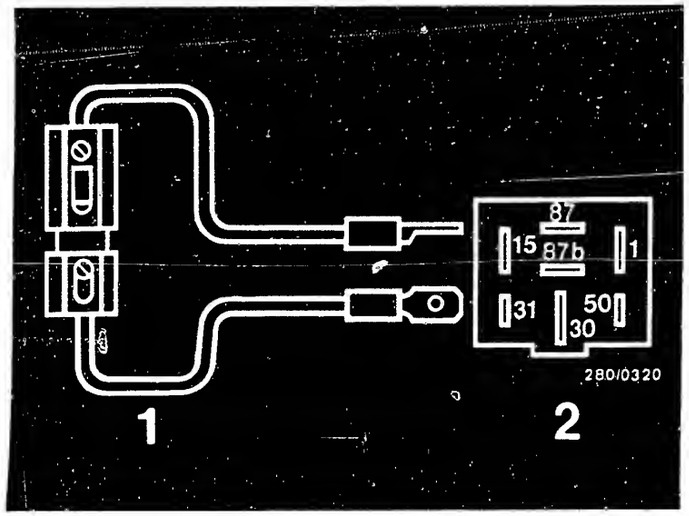
↓

Continued on G13/G14



Arrow=fuel return line

Jumper (user-fabricated)
1=Fuse holder with 10 A fuse
2=Top view of connection base



Engine missing under all operating conditions (continued)

Burbling on the overrun? throttle valve closed? CO and idle adjustment O.K.?

no →

1. Check the exhaust system for leaks.
2. Throttle valve closed?
Check whether the throttle valve can be closed still further and whether the engine speed thereby drops.

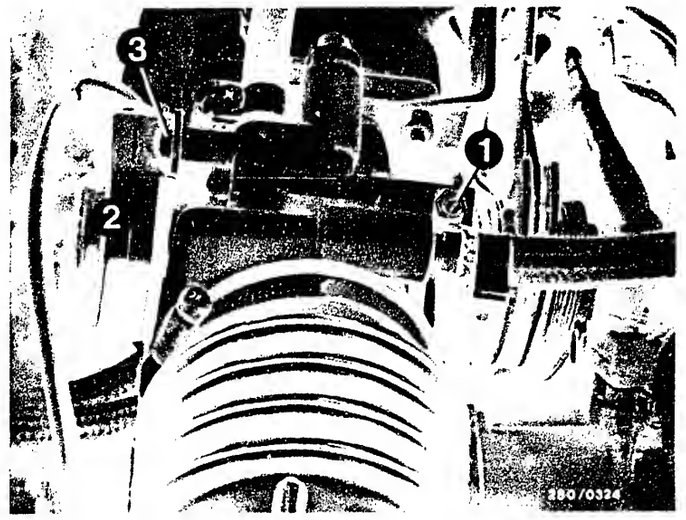
Adjustment:
Throttle valve must be set to just before it sticks with the throttle-valve stop screw.
Turn 1/4 to max. 1/2 turns in opposite direction.

Adjusting the throttle-valve switch:
Slightly loosen the throttle-valve switch fastening screws and turn the throttle-valve switch in an anti-clockwise direction until idle contact (microswitch) is heard to click.

Checking the adjustment:
Pull slightly on the throttle cable. The idle contact (microswitch) must be heard to click.

If a vacuum limiter is installed (Sweden only):
Pinch off the connecting hose before or after the vacuum limiter. Change in engine speed? If yes, replace vacuum limiter.

yes



1=Throttle-valve stop screw
2=Throttle-valve switch
3=Fastening screws

Continued on G15/G16

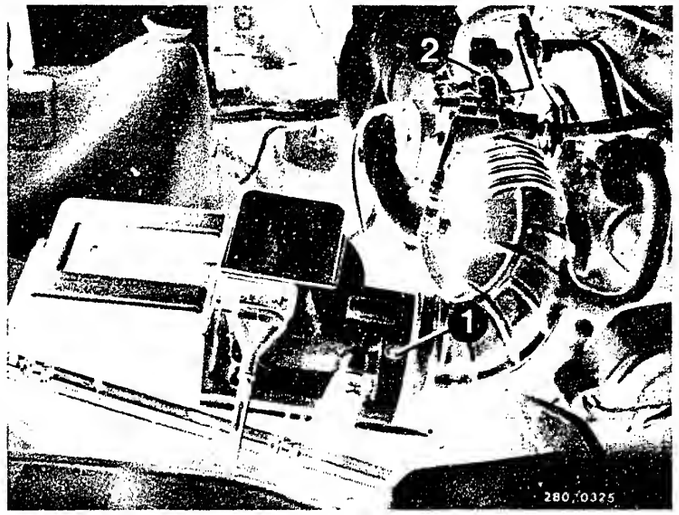
Engine missing under all operating conditions (continued)

Burbling on the overrun? throttle valve closed? CO and idle adjustment O.K.? (continued)

no →

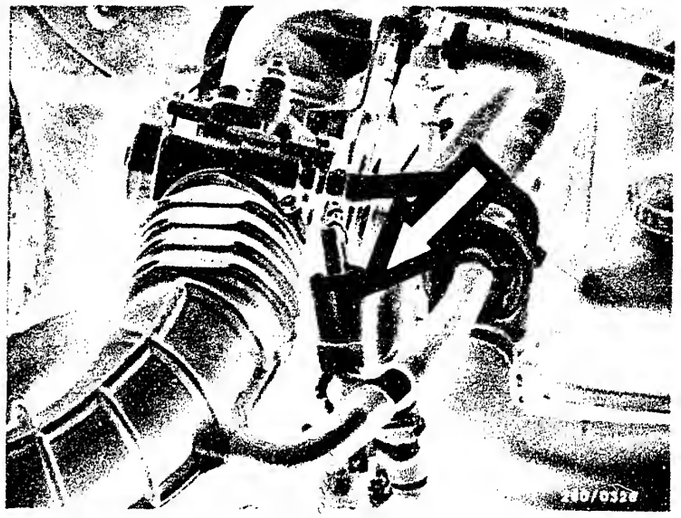
3. Testing the overrun cutoff:
Bring the engine to 3000 min^{-1} and, using insulated wire, bridge term. 2 and term. 9 in the plug of the throttle-valve switch.
Far below ambient temperature (+15°C...+30°C):
Up to approx. 2060 min^{-1} there must be no injection pulses. Below 2060 min^{-1} the injection pulses must be present again. The reinstatement speed is approx. 300 min^{-1} higher.
Warm engine temperature (approx. 80°C):
Up to approx. 1300 min^{-1} there must be no injection pulses. Below 1300 min^{-1} the injection pulses must be present again. The reinstatement speed is approx. 300 min^{-1} higher.
4. CO and idle adjustment
Exhaust-gas test with CO analyzer with engine at normal operating temperature and at idle speed.
Idle speed
Manually-shifted transmission: 850...900 min^{-1}
Automatic transmission (Selector lever in position "P"): 850...900 min^{-1}
CO setting: max.1.0% by vol.CO
Let warmed-up engine idle with the air conditioner (if fitted) switched off. Apply battery voltage to the solenoid-operated air valve. Engine speed is increased by approx. 150 min^{-1}. If there is no change in engine speed, replace the solenoid-operated air valve.

yes



1=CO adjusting screw
2=Idle-speed-adjusting screw

Arrow=solenoid-operated air valve



Continued on G17/G18

Engine missing under all operating conditions (continued)

Burbling on the overrun? throttle valve closed? CO and idle adjustment O.K.? (continued)

no → If CO concentration too high, turn bypass screw (CO adjusting screw) in air-flow sensor half a turn in a counterclockwise direction. Check engine speed and CO concentration. Carry out adjustments in several steps. After adjusting, use new plugs.

yes

Solenoid-operated injection valve mechanically O.K.

no → With the engine running, disconnect the injection valve connectors individually, one after the other, from the injection valves and plug on again. Engine speed must drop if injection valve is O.K.. Using ohmmeter, test for continuity in the connecting leads from control relay term. 87 to the individual injection valves and from the injection valves to the multiple plug term. 12. Set value approx. 0 Ω. Resistance of the individual injection valves: 15.0.. 20.0 Ω. Caution! when replacing the injection valves, install only solenoid-operated injection valve 0 280 150 205 (yellow plug part).

yes

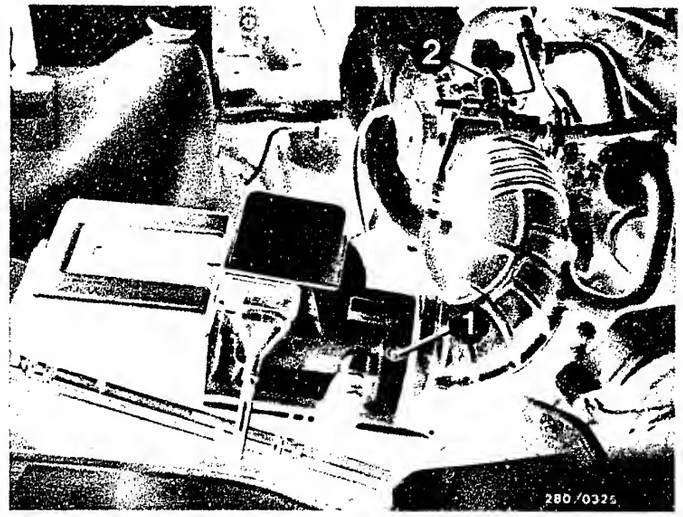
Testing completed for customer complaint

"Engine missing under all operating conditions"

Customer complaint remedied

no → Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates B3...B8). If the fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinate B3/B4).
- Engine not mechanically O.K. (compression, valve setting, valve timing, worn camshaft).



1=CO adjusting screw
2=Idle-speed-adjusting screw

Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

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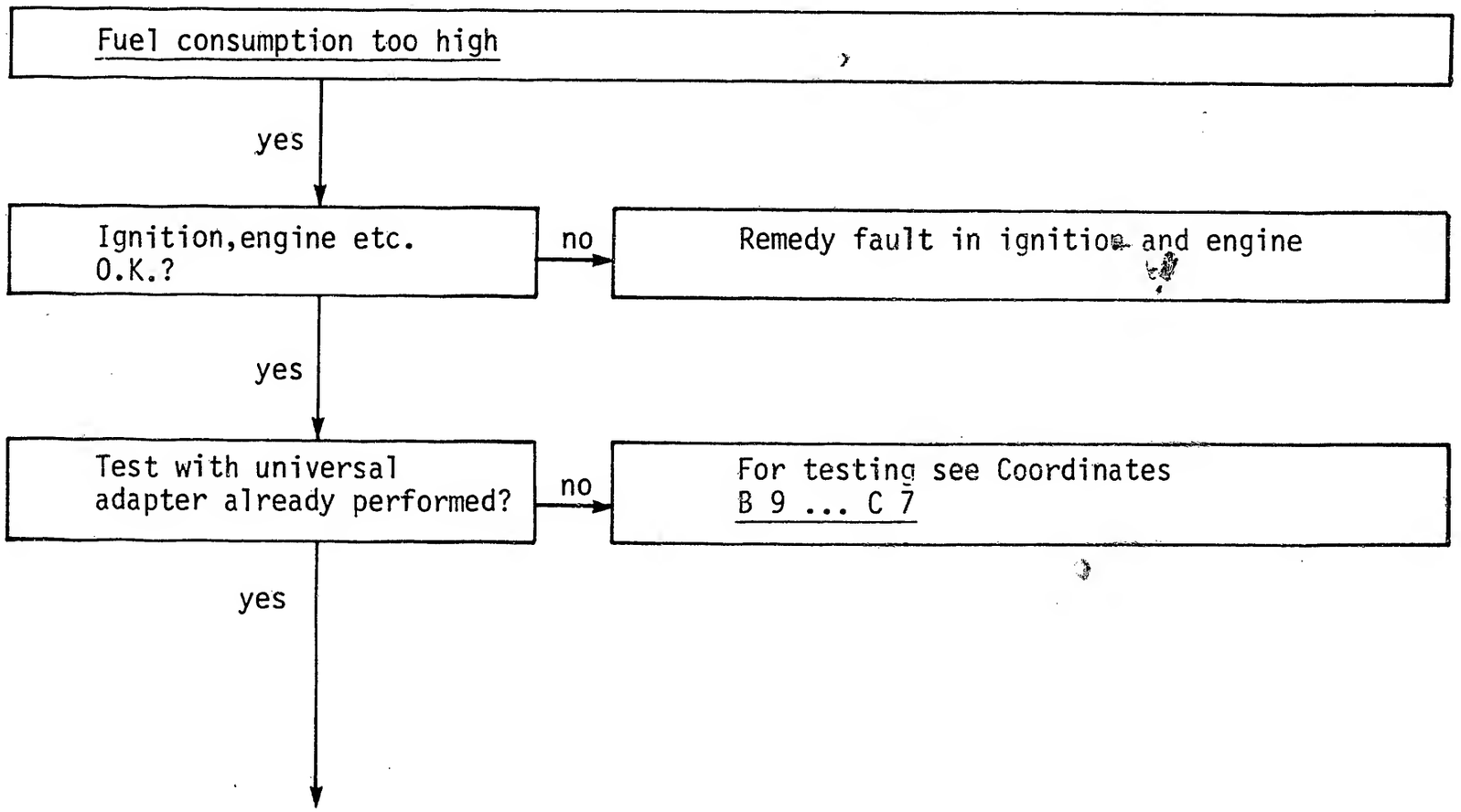


Continuedon G21/G22

Fuel consumption too high (continued)

Have all brakes released fully?

yes

Fuel pressure O.K.?

Test specification:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

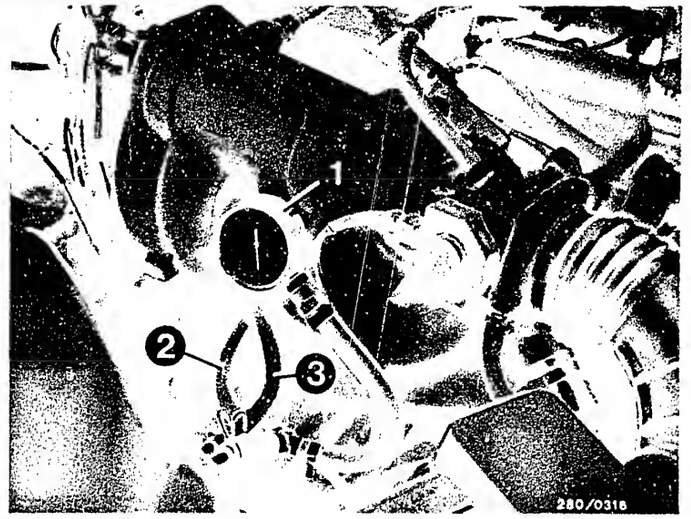
Test specification reached?

no

Testing the fuel pressure
Connect the connections of the pressure tester into the fuel delivery line. If using pressure tester KDJE-P 100, close the hollow screw when testing the LE-Jetronic.

Caution: When removing the fuel hose make sure that no fuel gets onto hot parts of the engine.

yes



1=Pressure gauge (pressure tester 1 687 231 154)
2=Fuel delivery line
3=Fuel return line

Continued on G23/G24

Fuel consumption too high (continued)

Fuel pressure O.K.?

Test specification:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

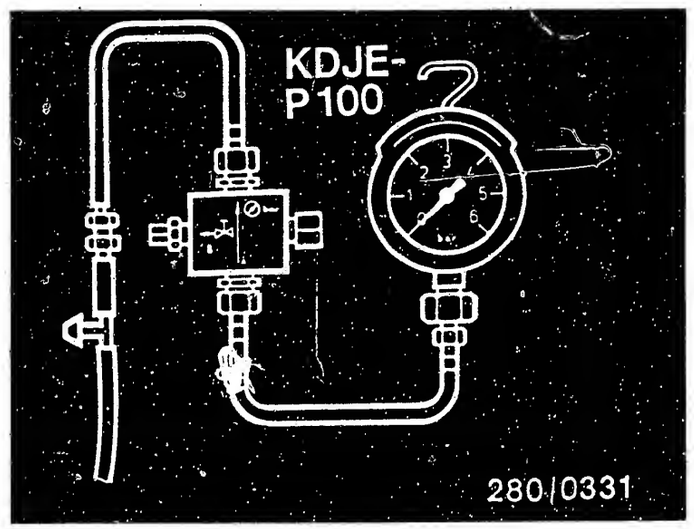
Test specification reached?

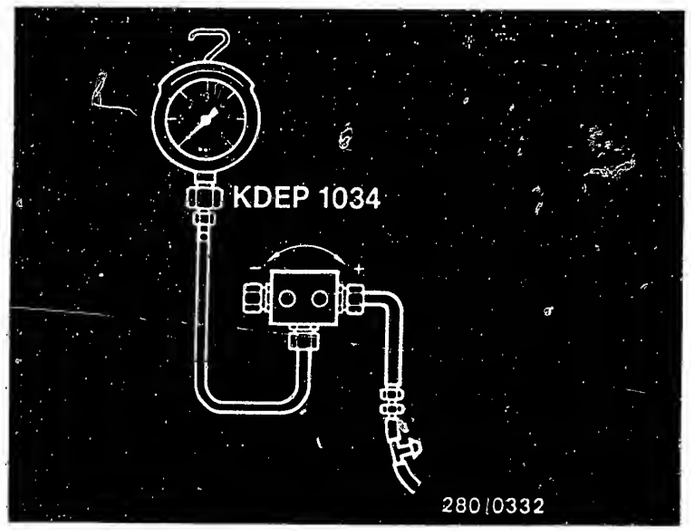
no

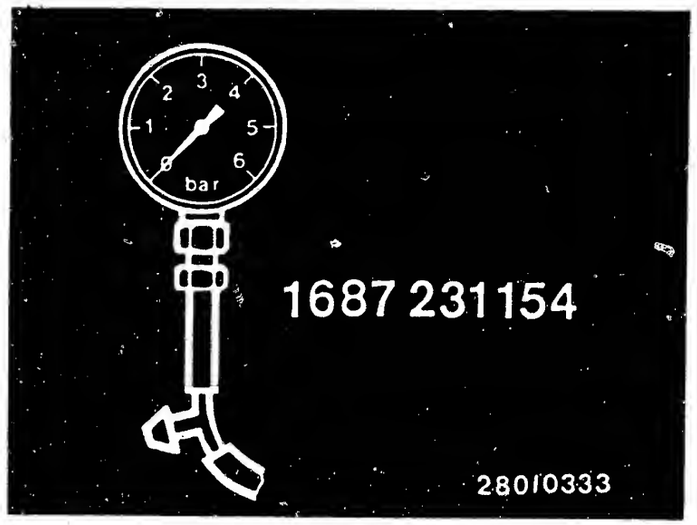
Unscrew fuel delivery line (at junction on wheel box on right-hand side).
Plug the Y-piece of the pressure tester onto the hose to the fuel-distribution pipe. Plug the hose of the pressure tester onto the fuel delivery line.
Make sure there are no leaks.

yes

Continued on H1/H2







Fuel consumption too high (continued)

Fuel pressure O.K.?

Test specification:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

Pressure regulator O.K.?
Test specification reached?

no →

Remove the control relay. Fit a jumper into the connection base between term. 87b and term. 30.
Fuel pump must operate
Fuel pump pressure:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar
Caution!
Remove the jumper and fit the control relay in position. Let the engine idle → fuel pump pressure approx. 2.0 bar or 2.5 bar.

Testing the pressure regulator
Remove the control relay and fit a jumper into the connection base between term. 87b and term. 30.
Electric fuel pump must operate.

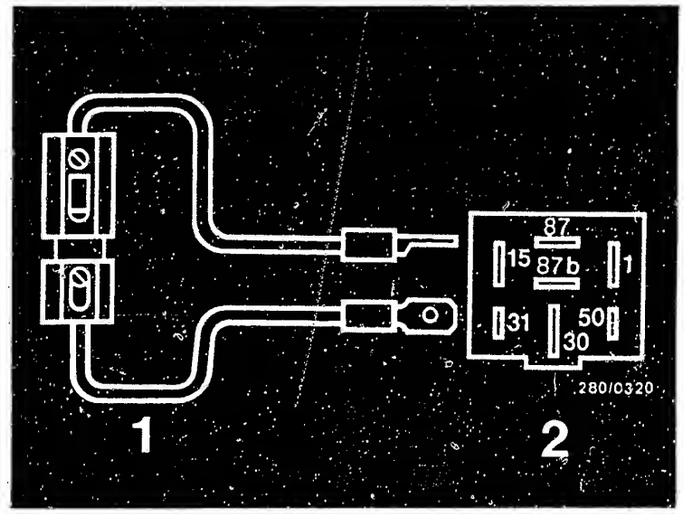
Fuel pump pressure:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

Fuel pressure of 2.3 bar or 2.8 bar not reached:
1. Slowly pinch off fuel return line: (caution: do not load pressure gauge above 6 bar).

Pressure rises above 4 bar → replace pressure regulator.
Pressure remains below 4 bar → replace fuel pump.

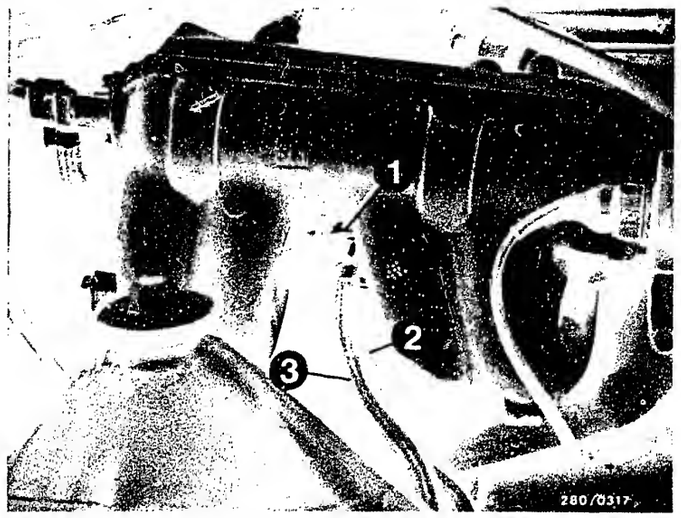
yes

Continued on H3/H4



Jumper (user-fabricated)
1=Fuse holder with 10 A fuse
2=Top view of connection base

1=Pressure regulator
2=Fuel delivery line
3=Fuel return line



Fuel consumption too high (continued)

Fuel pressure O.K.?

Test specification:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

Pressure regulator O.K.?
Test specification reached?

no

Opel Manta 2.0 l:

2. Check fuel delivery line and fuel filter for throughflow.
3. Strainer in tank clogged.
4. Corrosion in tank.

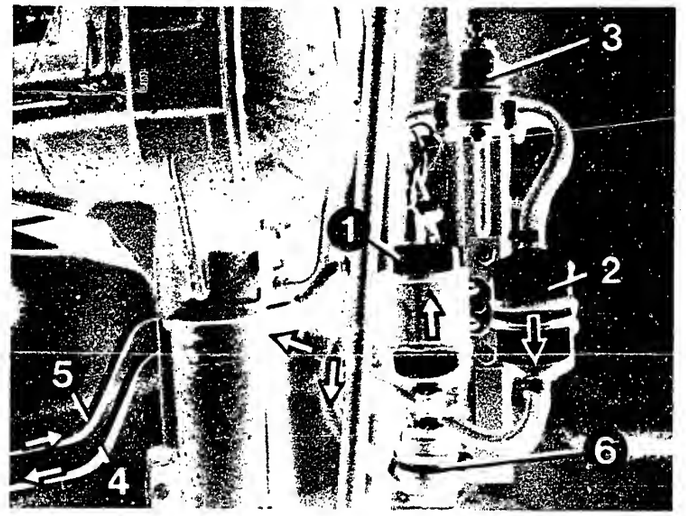
Fuel pressure of 2.7 bar or 3.2 bar exceeded:

1. Fuel return line clogged or pinched.
2. Replace pressure regulator.

Caution!
Jumper must be removed again after test is completed, and the control relay must be fitted in position.

yes

Continued on H5/H6



Arrangement of components in Opel Manta

1=Electric fuel pump
2=Fuel filter
3=Fuel-line-pressure damper
4=Fuel delivery line
5=Fuel return line
6=Fuel strainer

Arrows=direction of fuel flow

Fuel consumption too high (continued)

Fuel pressure O.K.?

Test specification:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

Pressure regulator O.K.?
Test specification reached?

no

Opel Rekord 2.0 l:

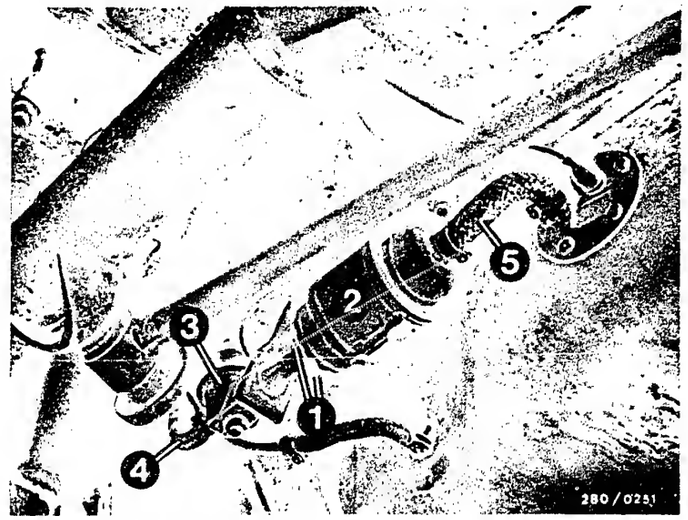
2. Check fuel delivery line and fuel filter for throughflow.
3. Strainer in tank clogged.
4. Corrosion in tank.

Fuel pressure of 2.7 bar or 3.2 bar exceeded:
1. Fuel return line clogged or pinched.
2. Replace pressure regulator.

Caution!
Jumper must be removed again after test is completed and the control relay must be fitted in position.

yes

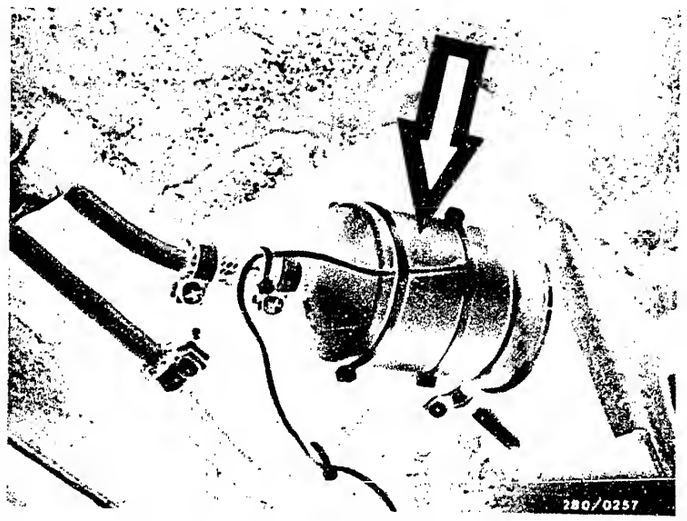
Continued on H7/H8



Arrangement of components in Opel Rekord

1=Electrical connections
2=Electric fuel pump
3=Fuel-line-pressure damper
4=Fuel delivery line
5=Fuel intake line

Arrow=fuel filter



Fuel consumption too high (continued)

Solenoid-operated injection valves mechancially O.K.?

no

With the engine running, disconnect the injection valve connectors individually, one after the other, from the injection valves and plug on again. Engine speed must drop if injection valve is O.K.. Using ohmmeter, test for continuity in the connecting leads from control relay term. 87 to the individual injection valves and from the injection valves to the multiple plug term. 12. Set value approx. 0 Ω. Resistance of the individual injection valves: 15.0.. 20.0 Ω. Caution! when replacing the injection valves, install only solenoid-operated injection valve 0 280 150 205 (yellow plug part).

yes

Start valve O.K.? (leak test)

no

Testing the start valve for leaks

1. When installed:

Pinch off the fuel delivery line at the start valve. If engine then runs smoothly, replace start valve.

2. When removed:

Remove the start valve (caution! fire hazard!). Fuel lines and electric leads remain connected (place collector vessel under the start valve). Build up the fuel pressure (remove control relay and fit jumper into connection base between term. 87b and term. 30).

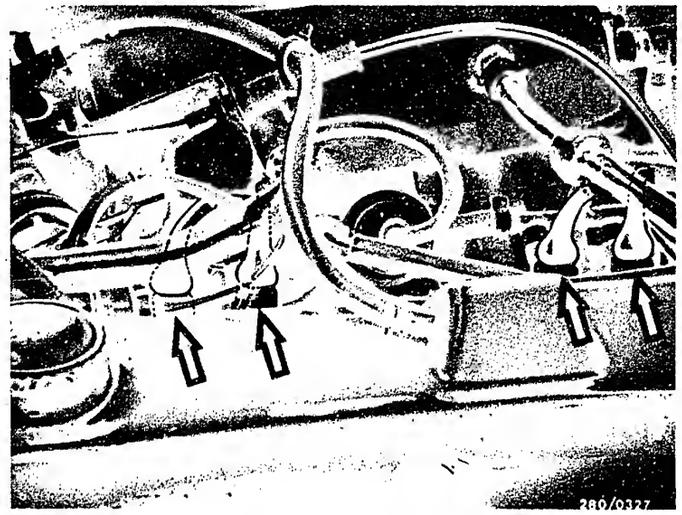
Caution!

The jumper must be removed again after test is completed and the control relay must be fitted in position.

Test specification: Within one minute max. 1 drop may form at the mouth of the valve.

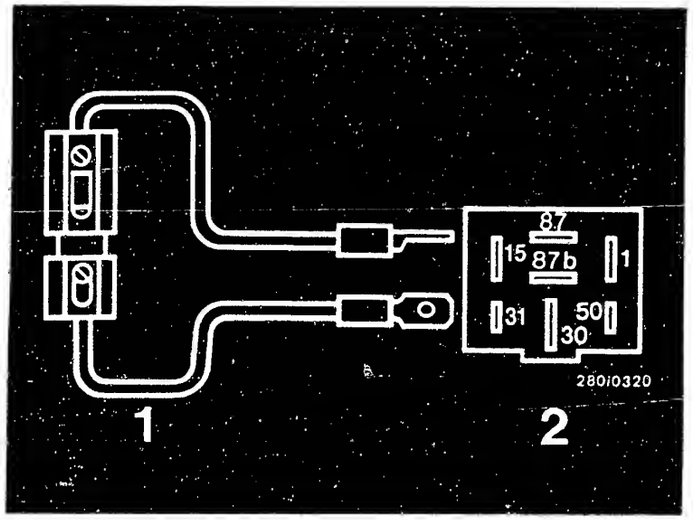
yes

Continued on H9/H10



1= Solenoid-operated injection valve

Jumper (user-fabricated)
1=Fuse holder with 10 A fuse
2=Top view of connection base



Fuel consumption too high (continued)

Temperature sensors tested ?

no

Testing:
Temperature sensor I measures the intake air temperature and is located in the air duct of the air-flow sensor. Measure the following resistance value between term. 8 and term. 9 of the air-flow sensor: 160...300 Ω. Make direct measurement at temperature sensor II (engine) using ohmmeter. Resistance measurement at term. 10 and term. 38 (ground):

Ambient temperature (+15°C...+30°C): 1.45...3.3 kΩ

Engine temperature (approx. +80°C) : 280 ... 360 Ω

If incorrect, check for open circuit or short circuit in following leads using ohmmeter:

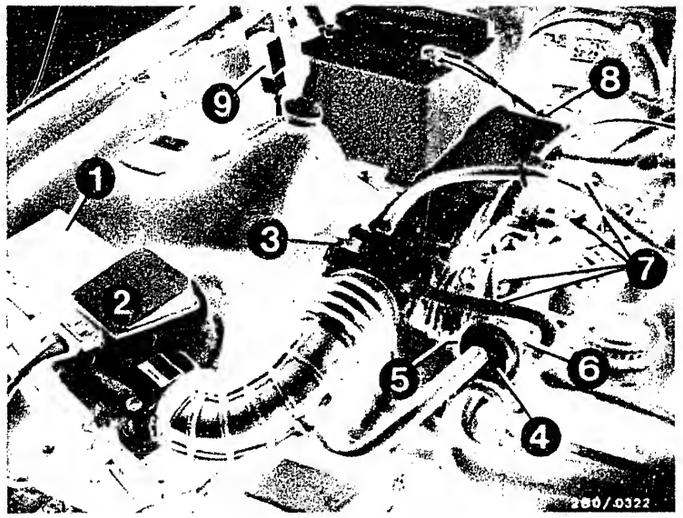
Temperature sensor I:
Multiple plug term. 8 to air-flow sensor term. 8 and air-flow sensor term. 9 to multiple plug term. 9.

Temperature sensor II:
Multiple plug term. 10 to temperature sensor II term. 10 and temperature sensor II term. 38 to central ground (lead 38).

Check all contacts in the plug-in connections.

yes

Continued on H11/H12



6=Temperature sensor II (white plug)

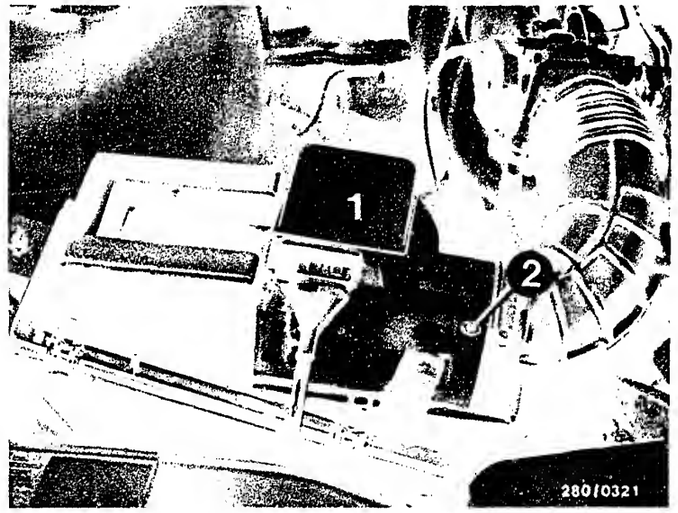
Fuel consumption too high (continued)

Air-flow sensor O.K.? — no

Testing:
Open air-flow sensor flap by hand. It must be possible to open the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. When the air-flow sensor flap is opened it must not catch at any point. Watch for any indications of abrasion or rubbing. Clean air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are any signs of abrasion or rubbing, replace the air-flow sensor.
Connect ohmmeter to term. 8 and term. 9 of air-flow sensor. Test specification: 160...300 Ω.
Connect ohmmeter to term. 7 and term. 5 of air-flow sensor. Deflect air-flow sensor flap. Test specification: 60...1000 Ω. Sensor flap must return to rest position. If not, the stopper or the sensor flap is bent. Replace air-flow sensor.

yes

Continued on H13/H14



1=Air-flow sensor
2=CO adjusting screw

Fuel consumption too high (continued)

CO and engine speed correctly adjusted?

no →

CO and idle adjustment
Exhaust-gas test with CO analyzer with engine at normal operating temperature and at idle speed.

Idle speed
Manually-shifted transmission: 850...900 min^{-1}
Automatic transmission (selector lever in position "P"): 850...900 min^{-1}
CO setting: max. 1.0% by vol.CO

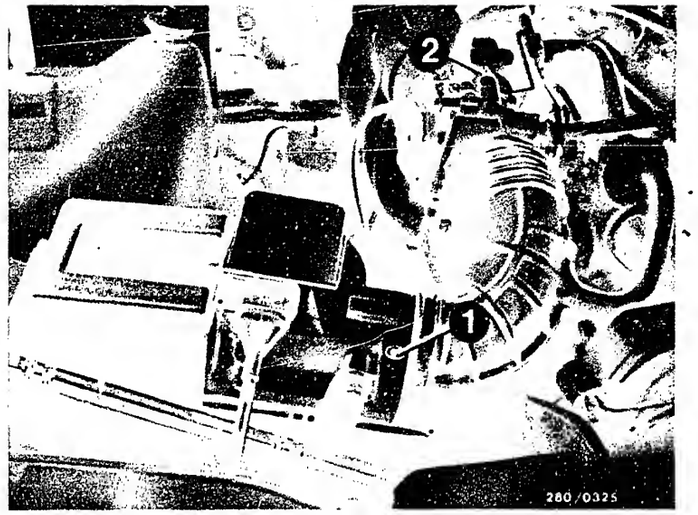
Let warmed-up engine idle with the air conditioner (if fitted) switched off.
Apply battery voltage to the solenoid-operated air valve. Engine speed is increased by approx. 150 min^{-1}. If there is no change in engine speed, replace the solenoid-operated air valve.
If CO concentration too high, turn bypass screw (CO adjusting screw) in air-flow sensor half a turn in a counterclockwise direction. Check engine speed and CO concentration. Carry out adjustments in several steps. After adjusting, use new plugs.

yes ↓

Can engine speed not be adjusted?

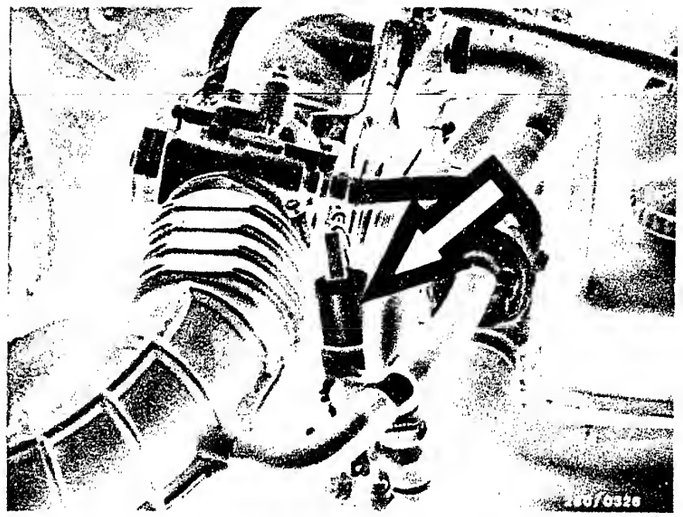
yes ↓

Continued on H15/H16



1=CO adjusting screw
2=Idle-speed-adjusting screw

Arrow= solenoid-operated air valve



Fuel consumption too high (continued)

Testing completed for customer complaint

"Fuel consumption too high"

Customer complaint remedied?

no

Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates B3...B8). If the fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinate B3/B4.
- Engine not mechanically O.K. (compression, valve setting, valve timing, worn camshaft).

Trouble-shooting program according to customer complaints

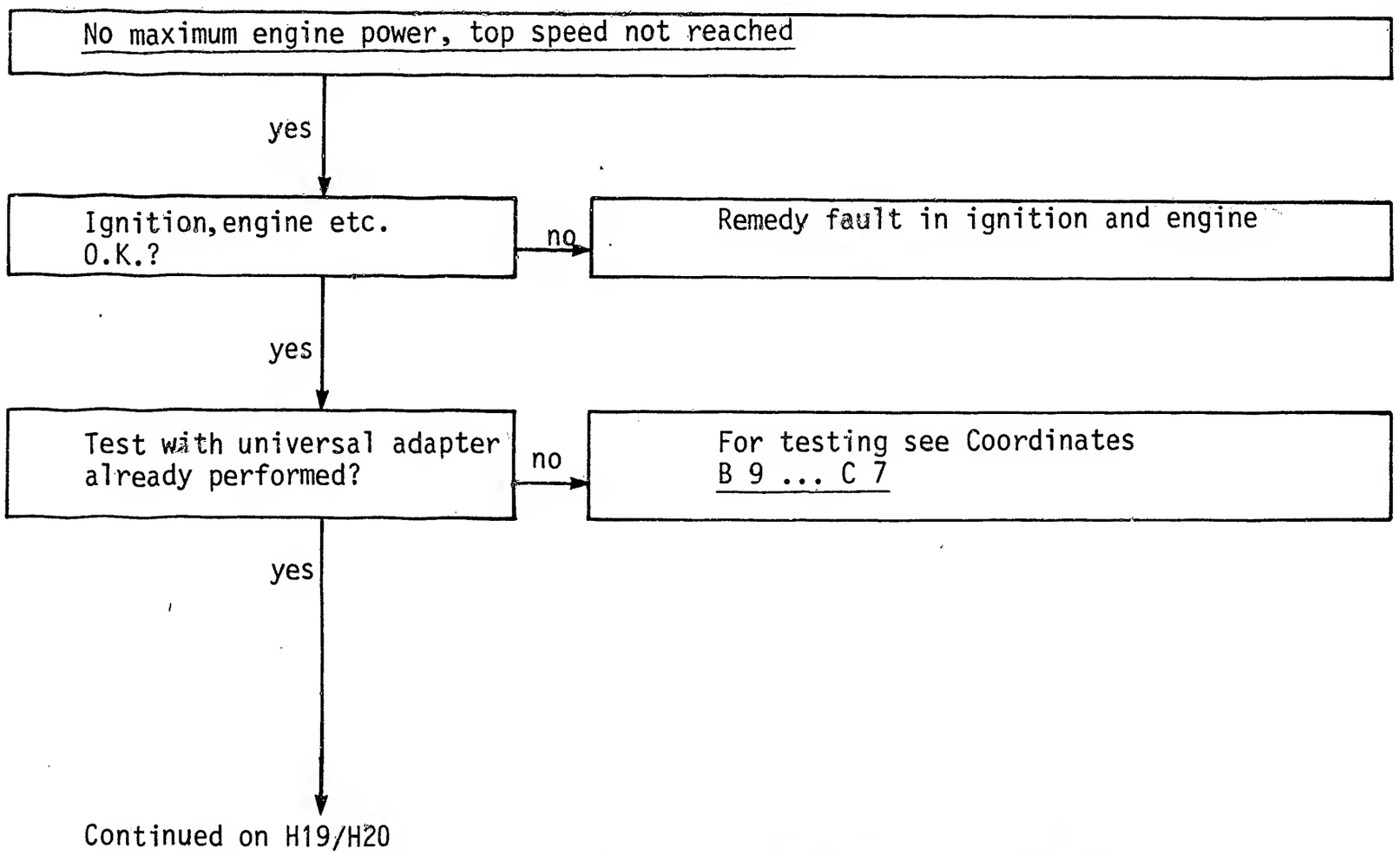
How to use the following trouble-shooting program

The program is divided into 3 rows of boxes:
1. The left-hand row contains the questions on the tests.
2. The middle row contains descriptions of the testing and adjustment operations on the components.
3. The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.



No maximum engine power, top speed not reached (continued)

Does throttle valve open fully?

no → Throttle linkage, accelerator pedal O.K.? Straighten linkage if necessary. Throttle linkage may stick due to floor mat etc.. Using ohmmeter, test for continuity in lead term. 3 from multiple plug to throttle-valve switch term. 3 and from throttle-valve switch term. 9 to multiple plug term. 9. Set value: approx. 0 Ω.

yes ↓

Fuel pressure O.K.?

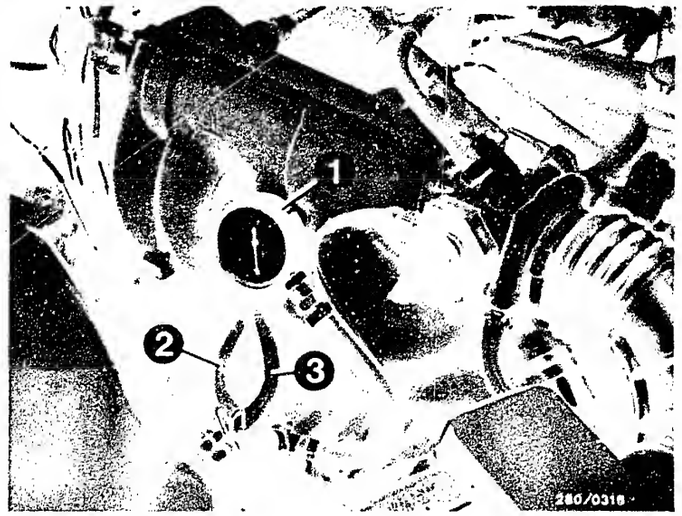
Test specification:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

Test specification reached?

no → Testing the fuel pressure
Connect the connections of the pressure tester into the fuel delivery line. If using pressure tester KDJE-P 100, close the hollow screw when testing the LE-Jetronic.

Caution:
When removing the fuel hose make sure that no fuel gets onto hot parts of the engine.

yes ↓



1=Pressure gauge (pressure tester 1 687 231 154)
2=Fuel delivery line
3=Fuel return line

Continued on H21/H22

No maximum engine power, top speed not reached (continued)

Fuel pressure O.K.?

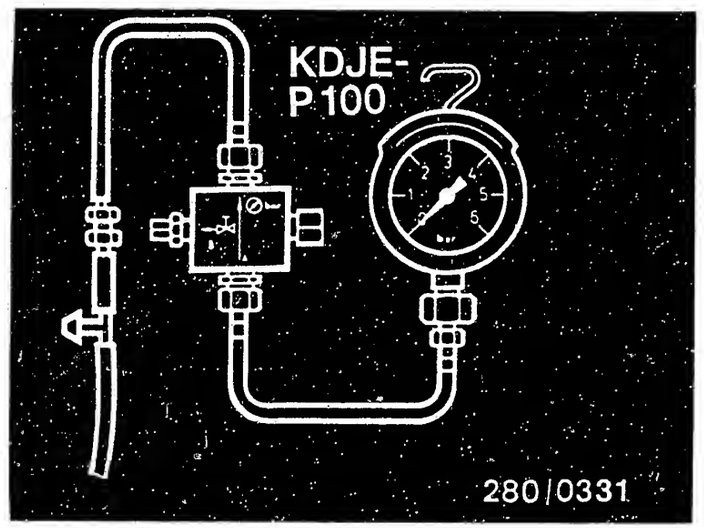
Test specification:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

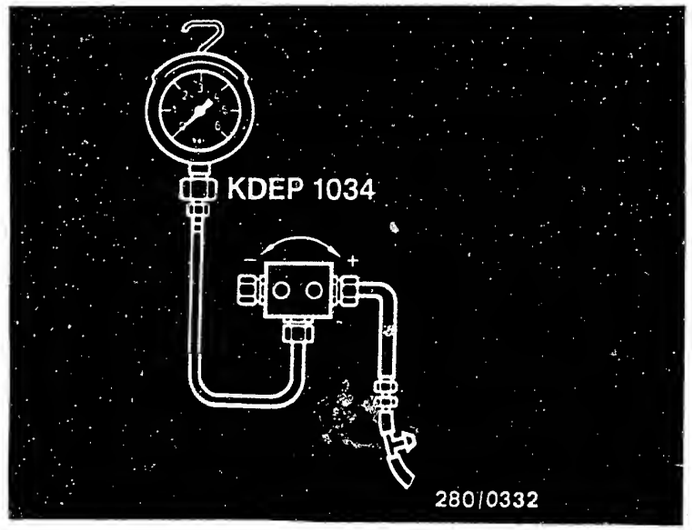
Test specification reached?

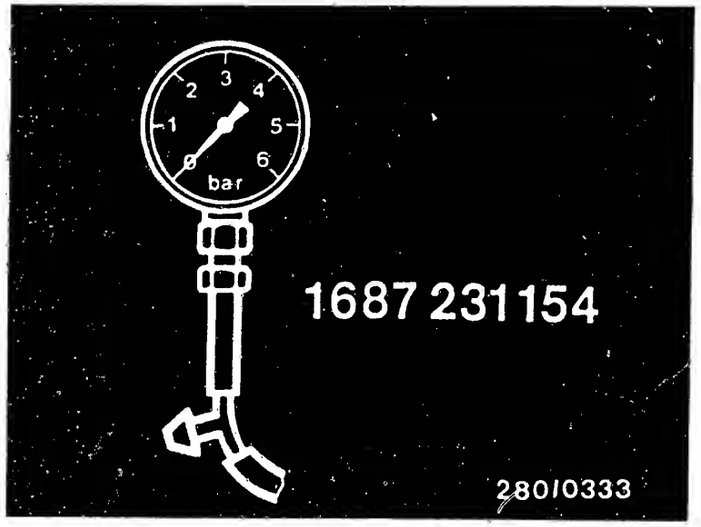
no → Unscrew fuel delivery line (at junction on wheel box on right-hand side).
Plug the Y-piece of the pressure tester onto the hose to the fuel-distribution pipe. Plug the hose of the pressure onto the fuel delivery line.
Make sure there are no leaks.

yes

Continued on H23/H24







No maximum engine power, top speed not reached (continued)

Fuel pressure O.K.?

Test specification:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

Pressure regulator O.K.?
Test specification reached?

no

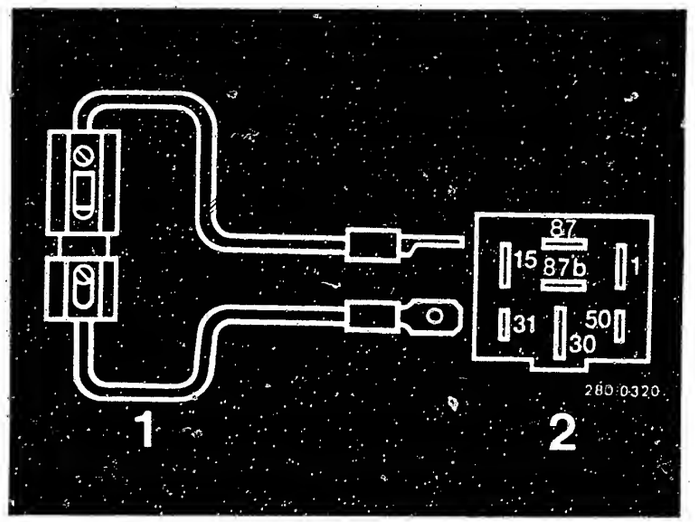
Remove the control relay. Fit a jumper into the connection base between term. 87b and term. 30.
Fuel pump must operate
Fuel pump pressure:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar
Caution!
Remove the jumper and fit the control relay in position. Let the engine idle → fuel pump pressure approx. 2.0 bar or 2.5 bar.

Testing the pressure regulator
Remove the control relay and fit a jumper into the connection base between term. 87b and term. 30.
Electric fuel pump must operate.
Fuel pump pressure:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

Fuel pressure of 2.3 bar or 2.8 bar not reached:
1. Slowly pinch off fuel return line: (caution: do not load pressure gauge above 6 bar).

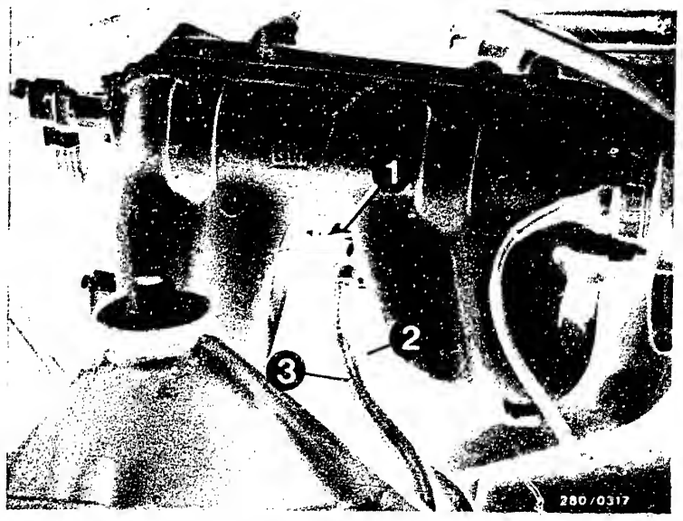
Pressure rises above 4 bar → replace pressure regulator.
Pressure remains below 4 bar → replace fuel pump.

yes



Jumper (user-fabricated)
1=Fuse holder with 10 A fuse
2=Top view of connection base

1=Pressure regulator
2=Fuel delivery line
3=Fuel return line



Continued on J1/J2

No maximum engine power, top speed not reached (continued)

Fuel pressure O.K.?

Test specification:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

Pressure regulator O.K.?
Test specification reached?

no

Opel Manta 2.0 l:

2. Check fuel delivery line and fuel filter for throughflow.
3. Strainer in tank clogged.
4. Corrosion in tank.

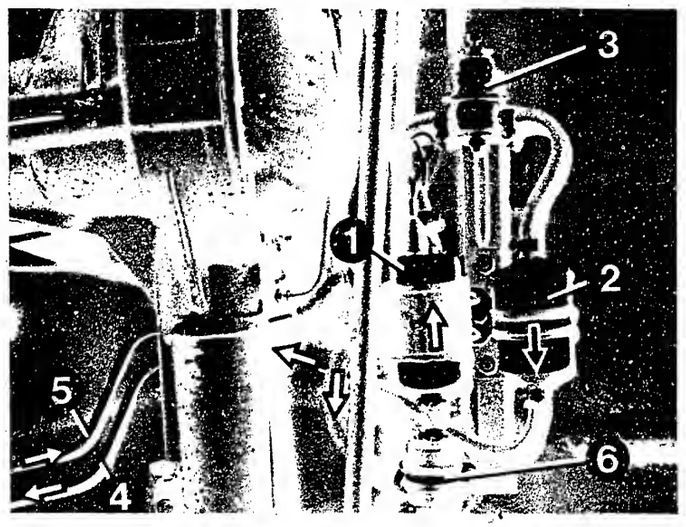
Fuel pressure of 2.7 bar or 3.2 bar exceeded:

1. Fuel return line clogged or pinched
2. Replace pressure regulator.

Caution!
Jumper must be removed again after test is completed, and the control relay must be fitted in position.

yes

Continued on J3/J4



Arrangement of components in Opel Manta

1=Electric fuel pump
2=Fuel filter
3=Fuel-line-pressure damper
4=Fuel delivery line
5=Fuel return line
6=Fuel strainer

Arrows=direction of fuel flow

No maximum engine power, top speed not reached (continued)

Fuel pressure O.K.?

Test specification:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

Pressure regulator O.K.?
Test specification reached?

no

Opel Rekord 2.0 l:

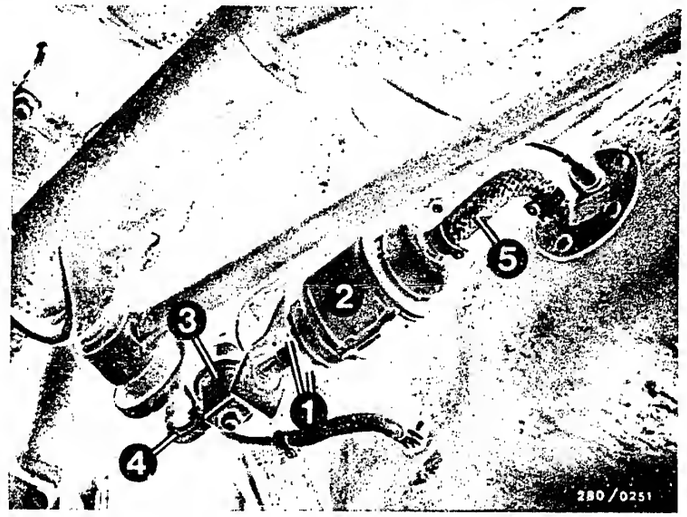
2. Check fuel delivery line and fuel filter for throughflow.
3. Strainer in tank clogged.
4. Corrosion in tank.

Fuel pressure of 2.7 bar or 3.2 bar exceeded:
1. Fuel return line clogged or pinched.
2. Replace pressure regulator.

Caution!
Jumper must be removed again after test is completed and the control relay must be fitted in position.

yes

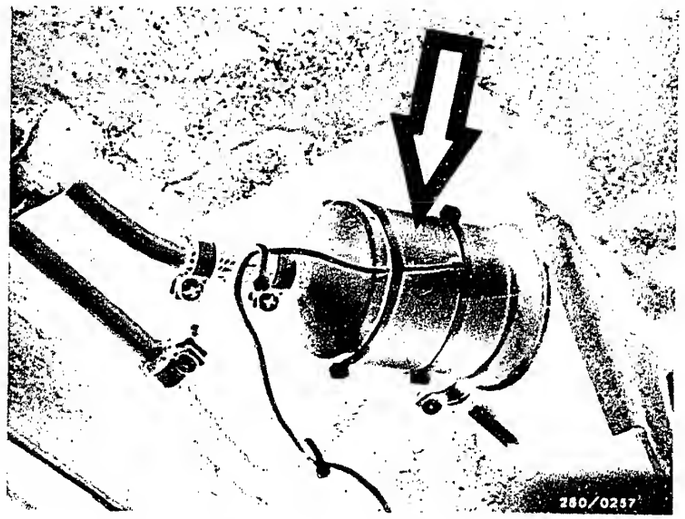
Continued on J5/J6



Arrangement of components in Opel Rekord

1=Electrical connections
2=Electric fuel pump
3=Fuel-line-pressure damper
4=Fuel delivery line
5=Fuel intake line

Arrow=fuel filter



No maximum engine power, top speed not reached (continued)

Fuel delivery O.K.?

no

Measuring the fuel delivery:
For testing, undo the junction between the fuel return hose (from pressure regulator) and fuel return line (to fuel tank). If necessary, extend hose and lead into a 5 l vessel with graduated scale.
Remove the control relay and fit a jumper into the connection base between term. 87b and term. 30.
Fuel pump must operate.

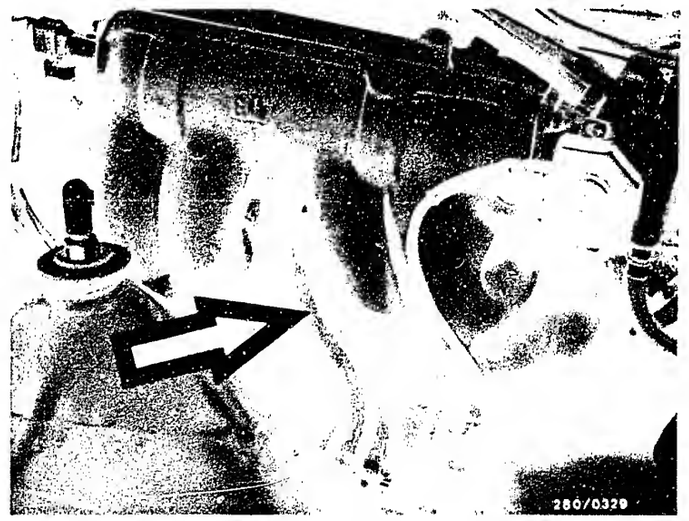
Caution! Be sure to remove the jumper after you have finished testing.
Test specification: min. 700 cm³/30s

Remedy if test specification not reached:

- Fuel filter clogged → replace
- Voltage at fuel pump plugs, with engine running min. 12V → clean contacts; possibly also eliminate poor ground connection; replace leads.
- Fuel pressure regulator defective → replace
- Fuel pump delivery too low → replace fuel pump.

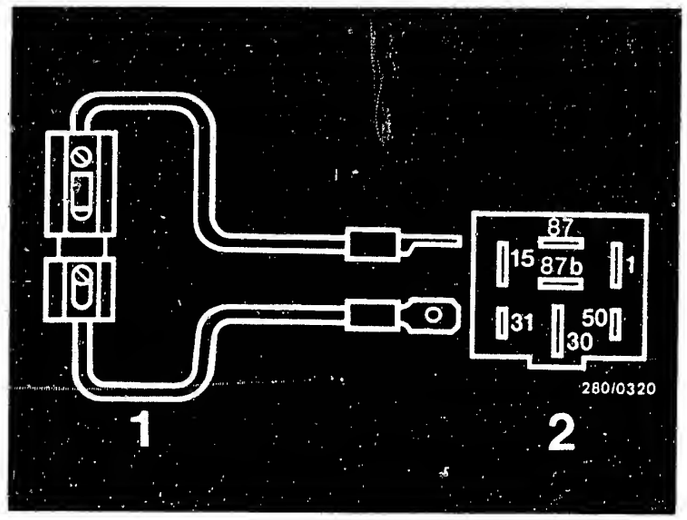
yes

Continued on J7/J8



1=Fuel return line

Jumper (user-fabricated)
1=Fuse holder with 10 A fuse
2= Top view of connection base



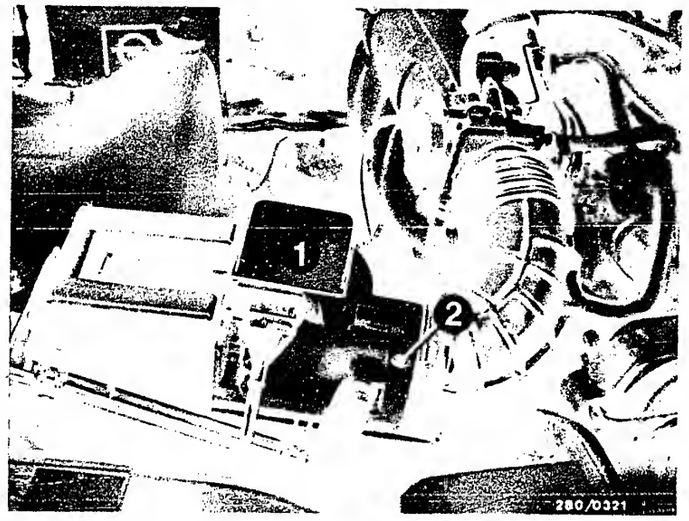
No maximum engine power, top speed not reached (continued)

Air-flow sensor O.K.?

no

Testing:
Open air-flow sensor flap by hand. It must be possible to open the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. When the air-flow sensor flap is opened it must not catch at any point. Watch for any indications of abrasion or rubbing. Clean air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are any signs of abrasion or rubbing, replace the air-flow sensor.
Connect ohmmeter to term. 8 and term. 9 of air-flow sensor. Test specification: 160...300 Ω.
Connect ohmmeter to term. 7 and term. 5 of air-flow sensor. Deflect air-flow sensor flap. Test specification: 60...1000 Ω. Sensor flap must return to rest position. If not, the stopper or the sensor flap is bent. Replace air-flow sensor.

yes



1=Air-flow sensor
2=CO adjusting screw

Continued on J9/J10

No maximum engine power, top speed not reached (continued)

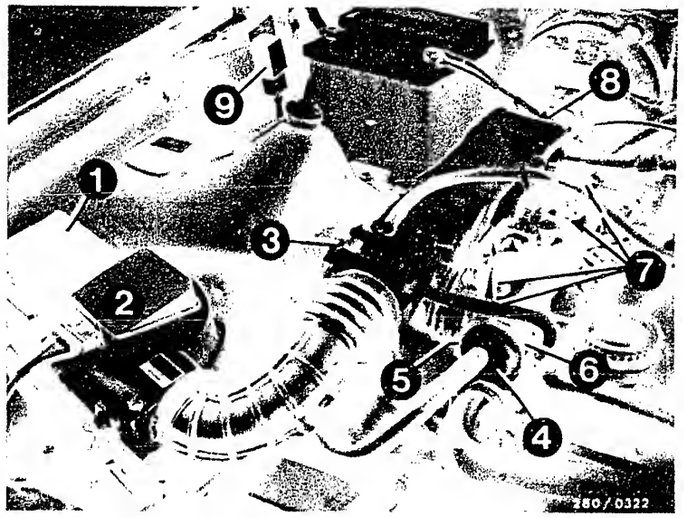
Are all hose lines and electric leads securely attached?
Visual examination.
Is the air-intake system leak-tight?

no →

Check whether hoses of air-intake system and of fuel line system are securely attached, not kinked or damaged. If necessary, replace hoses. Eliminate leaks with new seals or by re-tightening the connecting screws.
Checking for leaks:
Seal off exhaust tail pipe. Screw off hose from air filter to air-flow sensor on air-flow sensor and seal off air-flow sensor duct. Pull off hose after auxiliary-air device and blow air (0.3 bar gauge pressure) into the intake manifold with a compressed-air gun. Seal off connection port on auxiliary-air device. Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Bubbling or foaming indicates a leak.
Check electric contacts for loose connection.

yes

Continued on J11/J12



1=Air filter
2=Air-flow sensor
3=Throttle-valve switch
4=Auxiliary-air device
5=Thermo-time switch
6=Temperature sensor II (water)
7=Solenoid-op. injection valves
8=Start valve
9=Control relay

No maximum engine power, top speed not reached (continued)

Testing completed for customer complaint

"No maximum engine power"

Customer complaint remedied?

no

Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates B3...B8). If the fault has not been detected by "direct trouble-shooting" see "detailed trouble-shooting" (Coordinate B3/B4).
- Engine not mechanically O.K. (compression, valve setting, valve timing, worn camshaft).

Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

The program is divided into 3 rows of boxes:
1. The left-hand row contains the questions on the tests.
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If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.

CO adjustment at idle too low or too high

yes

Ignition, engine etc. O.K.? — no → **Remedy fault in ignition and engine**

yes

Test with test adapter already performed? — no → **For testing see Coordinates B 9 ... C 7**

yes

Continued on J15/J16

CO adjustment at idle too low or too high (continued)

CO and engine speed correctly adjusted?

no

CO and idle adjustment

Exhaust-gas test with CO analyzer with engine at normal operating temperature and at idle speed.

Idle speed

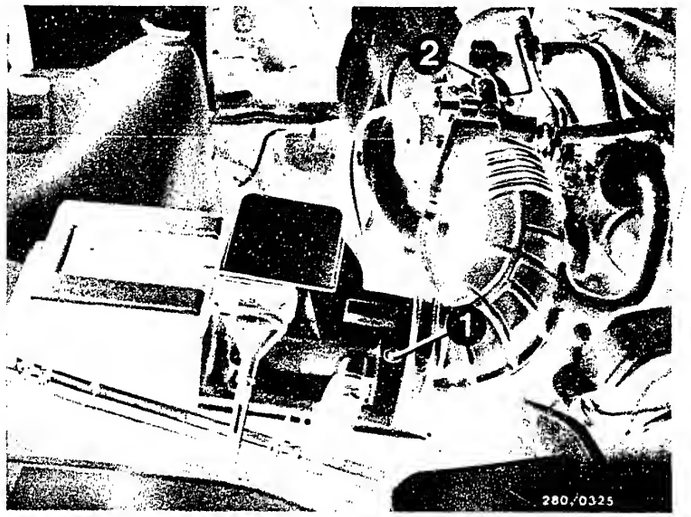
Manually-shifted transmission:	850...900 min^{-1}
Automatic transmission (selector lever in position "P"):	850...900 min^{-1}
CO setting:	max. 1.0% by vol.CO

Let warmed-up engine idle with the air conditioner (if fitted) switched off.
Apply battery voltage to the solenoid-operated air valve. Engine speed is increased by approx. 150 min^{-1}. If there is no change in engine speed, replace the solenoid-operated air valve.
If CO concentration too high, turn bypass screw (CO adjusting screw) in air-flow sensor half a turn in a counterclockwise direction. Check engine speed and CO concentration. Carry out adjustments in several steps. After adjusting, use new plugs.

yes

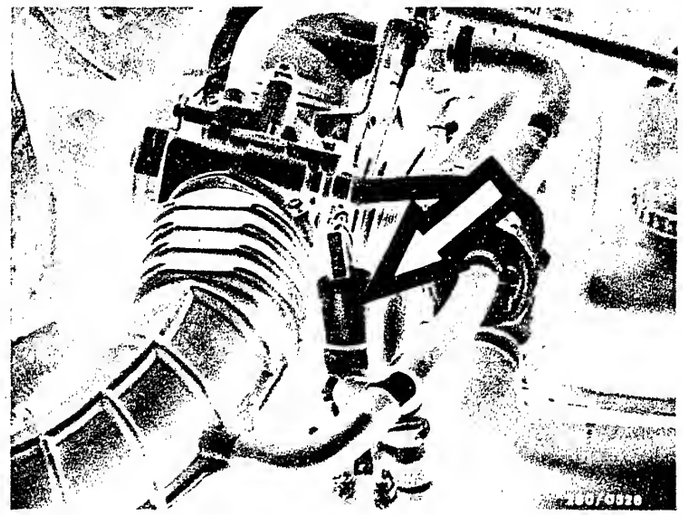
CO not adjustable?

Continued J17/J18



1=CO adjusting screw
2=Idle-speed-adjusting screw

Arrow=solenoid-operated air valve



CO adjustment at idle too low or too high (continued)

Air-flow sensor O.K.?

no

Testing:
Open air-flow sensor flap by hand. It must be possible to open the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. When the air-flow sensor flap is opened it must not catch at any point. Watch for any indications of abrasion or rubbing. Clean air-flow sensor if the inside is very dirty and rub out with a lint-free clotch. If there are any signs of abrasion or rubbing, replace the air-flow sensor.
Connect ohmmeter to term. 8 and term. 9 of air-flow sensor. Test specification: 160...300 Ω.
Connect ohmmeter to term. 7 and term. 5 of air-flow sensor. Deflect air-flow sensor flap. Test specification: 60...1000 Ω. Sensor flap must return to rest position. If not, the stopper or the sensor flap is bent. Replace air-flow sensor.

yes

Fuel pressure O.K.?

Test specification:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

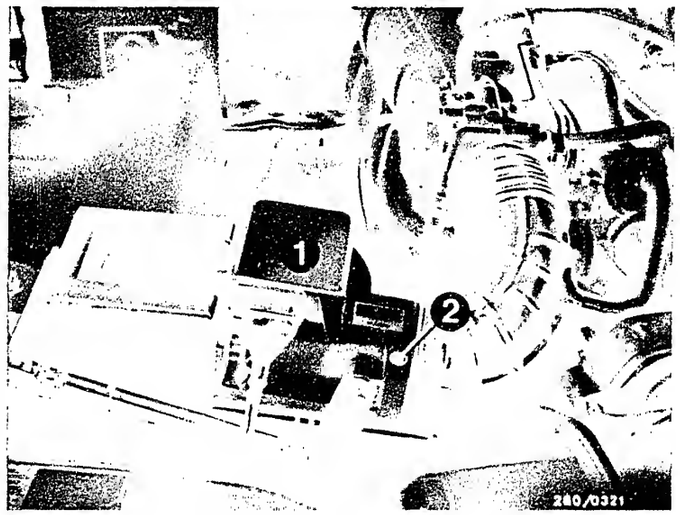
Test specification reached?

no

Testing the fuel pressure
Connect the connections of the pressure tester into the fuel delivery line. If using pressure tester KDJE-P 100, close the hollow screw when testing the LE-Jetronic.
Caution: When removing the fuel hose make sure that no fuel gets onto hot parts of the engine.

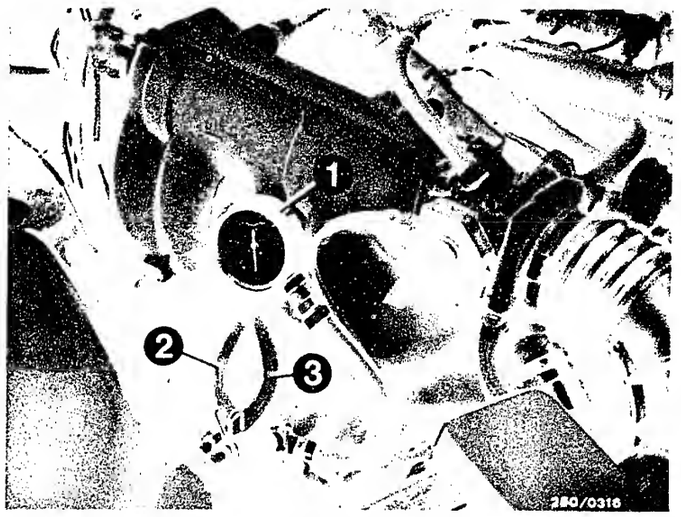
yes

Continued on J19/J20



1=Air-flow sensor
2=CO adjusting screw

1=Pressure gauge (pressure tester 1 687 231 154)
2=Fuel delivery line
3=Fuel return line



CO adjustment at idle too low or too high (continued)

Fuel pressure O.K.?

Test specification:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

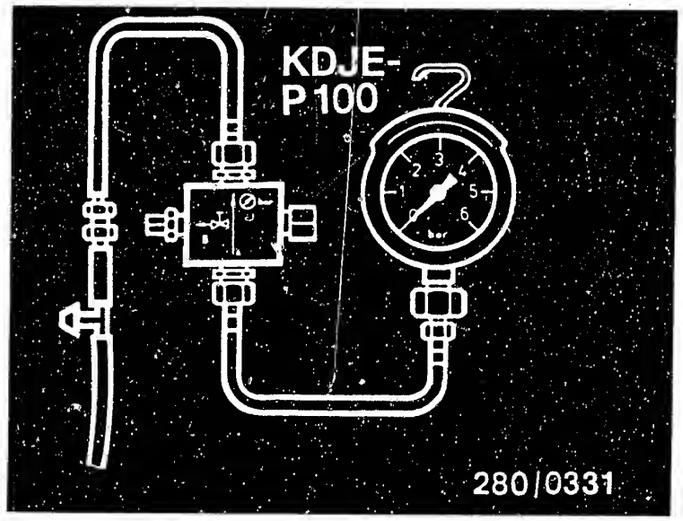
Test specification reached?

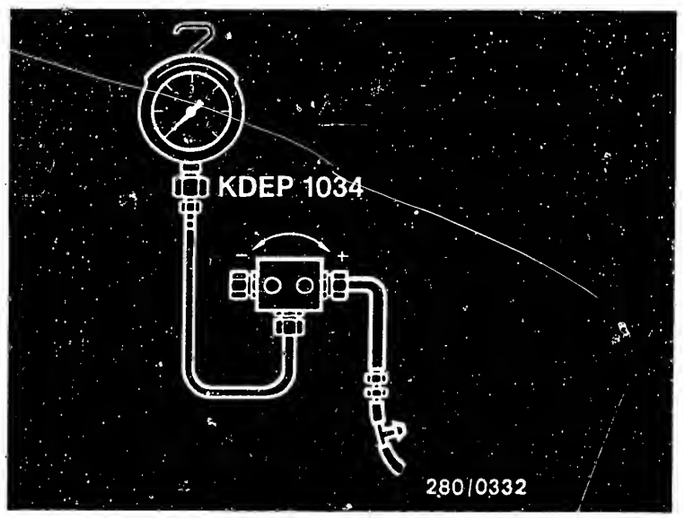
no

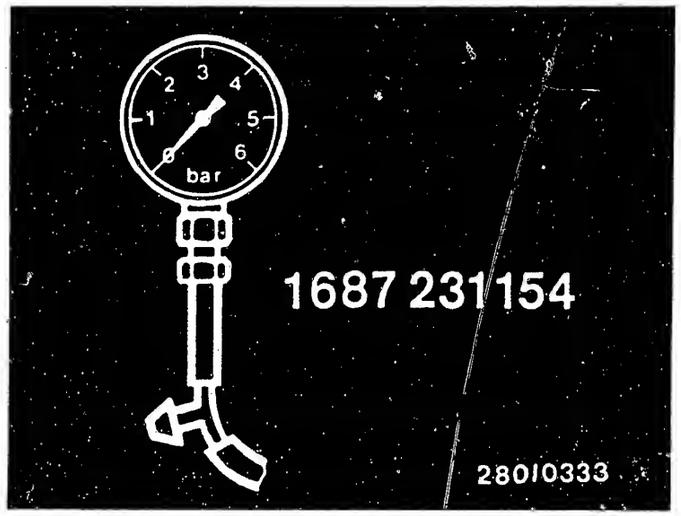
Unscrew fuel delivery line (at junction on wheel box on right-hand side).
Plug the Y-piece of the pressure tester onto the hose to the fuel-distribution pipe. Plug the hose of the pressure tester onto the fuel delivery line.
Make sure there are no leaks

yes

Continued on J21/J22







CO adjustment at idle too low or too high (continued)

Fuel pressure O.K.?

Test specification:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

Pressure regulator O.K.?
Test specification reached?

no →

Remove the control relay. Fit a jumper into the connection base between term. 87b and term. 30.
Fuel pump must operate
Fuel pump pressure:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar
Caution!
Remove the jumper and fit the control relay in position. Let the engine idle → fuel pump pressure approx. 2.0 bar or 2.5 bar.

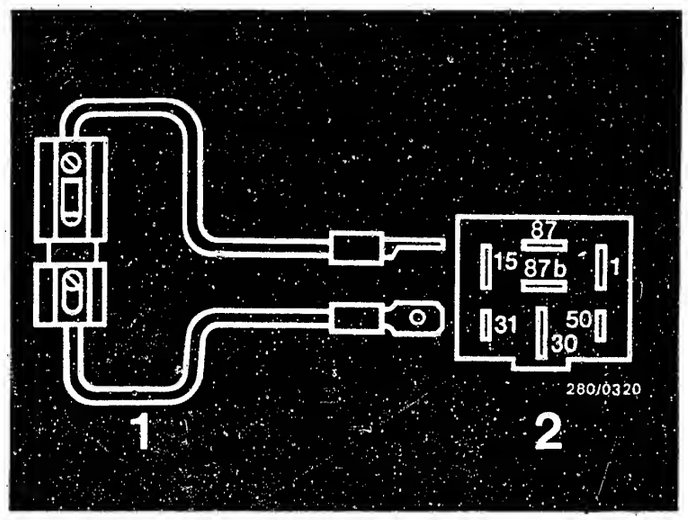
Testing the pressure regulator
Remove the control relay and fit a jumper into the connection base between term. 87b and term. 30.
Electric fuel pump must operate.
Fuel pump pressure:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

Fuel pressure of 2.3 bar or 2.8 bar not reached:
1. Slowly pinch off fuel return line: (caution: do not load pressure gauge above 6 bar).

Pressure rises above 4 bar → replace pressure regulator.
Pressure remains below 4 bar → replace fuel pump.

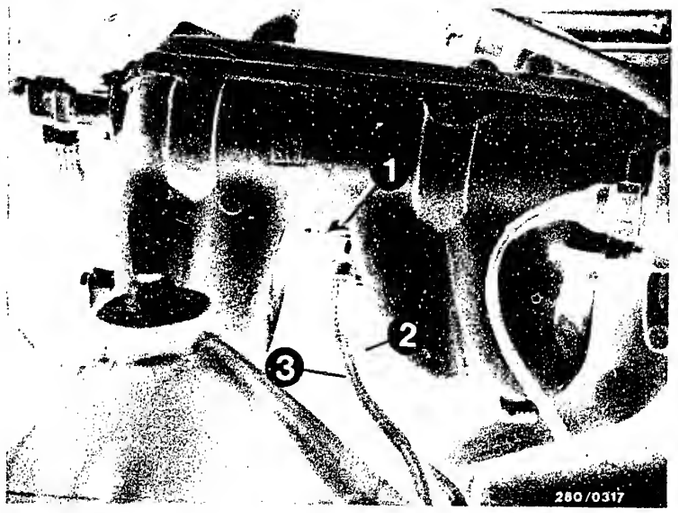
yes

Continued on J23/J24



Jumper (user-fabricated)
1=Fuse holder with 10 A fuse
2=Top view of connection base

1=Pressure regulator
2=Fuel delivery line
3=Fuel return line



CO adjustment at idle too low or too high (continued)

Fuel pressure O.K.?

Test specification:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

Pressure regulator O.K.?
Test specification reached?

no →

Opel Manta 2.0 l:

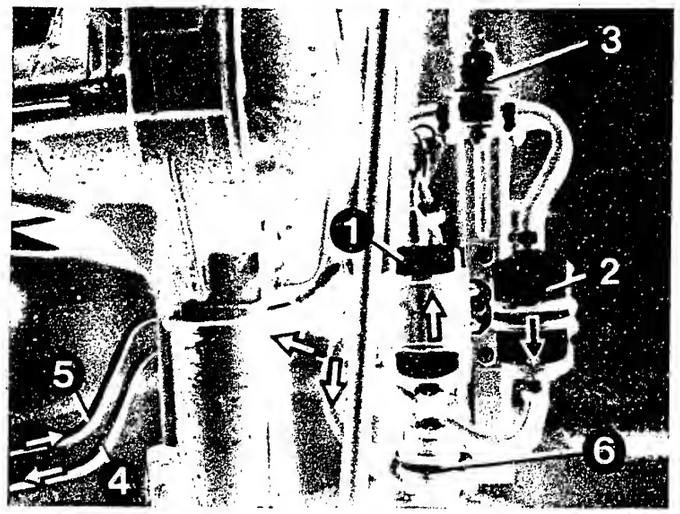
2. Check fuel delivery line and fuel filter for throughflow.
3. Strainer in tank clogged.
4. Corrosion in tank.

Fuel pressure of 2.7 bar or 3.2 bar exceeded:
1. Fuel return line clogged or pinched
2. Replace pressure regulator.

Caution!
Jumper must be removed again after test is completed, and the control relay must be fitted in position.

yes

Continued on K1/K2



Arrangement of components in Opel Manta

1=Electric fuel pump
2=Fuel filter
3=Fuel-line-pressure damper
4=Fuel delivery line
5=Fuel return line
6=Fuel strainer

Arrows=direction of fuel flow

CO adjustment at idle too low or too high (continued)

Fuel pressure O.K.?

Test specification:
Europe: 2.3...2.7 bar
Sweden: 2.8...3.2 bar

Pressure regulator O.K.?
Test specification reached?

no

Opel Rekord 2.0 l:

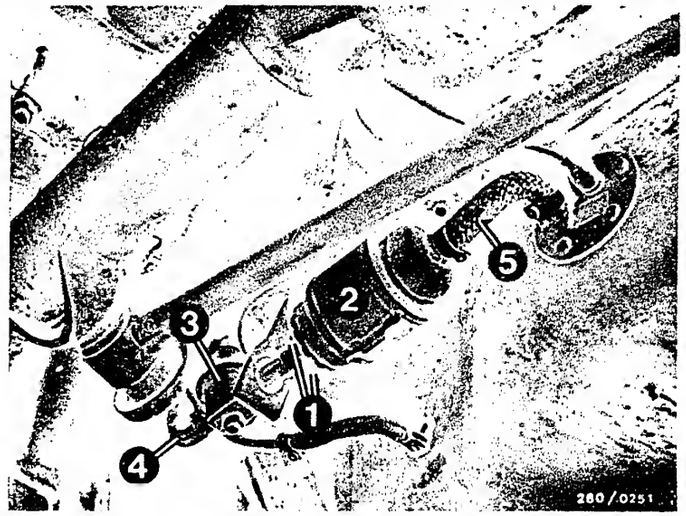
2. Check fuel delivery line and fuel filter for throughflow.
3. Strainer in tank clogged.
4. Corrosion in tank.

Fuel pressure of 2.7 bar or 3.2 bar exceeded:
1. Fuel return line clogged or pinched.
2. Replace pressure regulator.

Caution!
Jumper must be removed again after test is completed and the control relay must be fitted in position.

yes

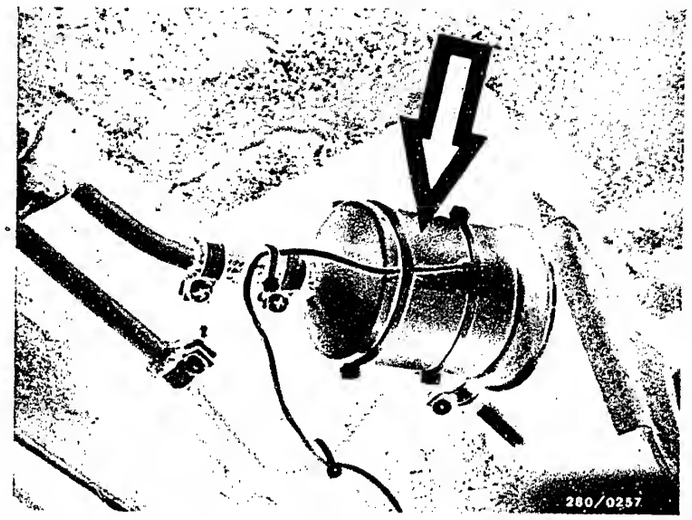
Continued on K3/K4



Arrangement of components in Opel Rekord

1=Electrical connections
2=Electric fuel pump
3=Fuel-line-pressure damper
4=Fuel delivery line
5=Fuel intake line

Arrow=fuel filter



CO adjustment at idle too low or too high (continued)

CO concentration below tolerance?

max. 1.0 % by vol.

Temperature sensors O.K.?

no

Testing:
Temperature sensor I measures the intake air temperature and is located in the air duct of the air-flow sensor. Measure the following resistance value between term. 8 and term. 9 of the air-flow sensor: 160...300 Ω.
Using ohmmeter, make direct measurement at temperature sensor II (engine). Reistance measurement at term. 10 and term. 38 (ground):
Ambient temperature (+15°C..+30°C): 1.45..3.3 kΩ

Engine temperature (approx.+80°C): 280..360 Ω

If incorrect, check for open circuit or short circuit in following leads using ohmmeter:

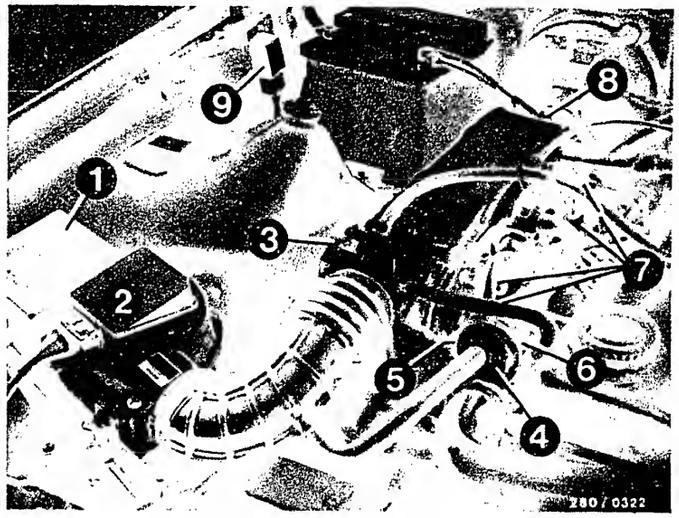
Temperature sensor I:
Multiple plug term. 8 to air-flow sensor term. 8 and air-flow sensor term. 9 to multiple plug term. 9.

Temperature sensor II:
Multiple plug term. 10 to temperature sensor II term. 10 and temperature sensor II term. 38 to central ground (lead 38).

Check all contacts in the plug-in connections.

yes

Continued on K5/K6



6=Temperature sensor II (white plug)

CO adjustment at idle too low or too high (continued)

CO concentration below tolerance?

max. 1.0 % by vol.

Start valve O.K.?

no

Testing the start valve for leaks:

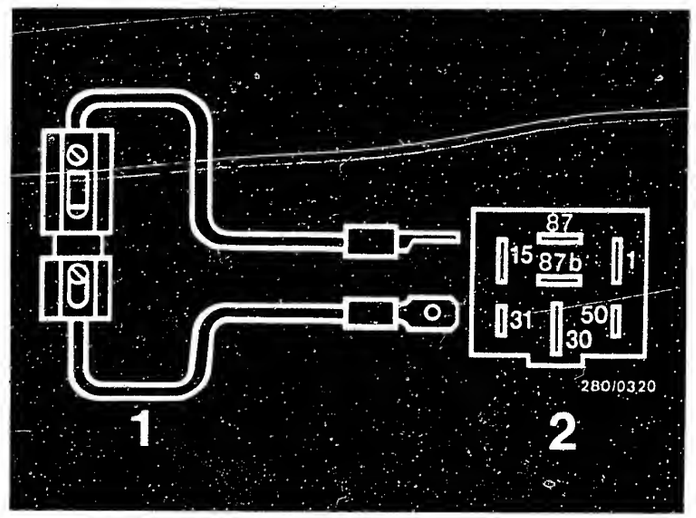
1. When installed
Pinch off the fuel delivery line at the start valve. If engine then runs smoothly, replace start valve.

2. When removed
Remove the start valve (caution! fire hazard!). Fuel lines and electric leads remain connected (place collector vessel under the start valve). Build up the fuel pressure (remove control relay and fit jumper into connection base between term. 87b and term. 30).
Caution!
The jumper must be removed again after test is completed and the control relay must be fitted in position.

Test specification: Within one minute max. 1 drop may form at the mouth of the valve.

yes

Continued on K7/K8



Jumper (user-fabricated)

1=Fuse holder with 10 A fuse
2=Top view of connection base

CO adjustment at idle too low or too high (continued)

CO concentration above 0.2 % by vol.?

Air-intake system leak tight?

no

Checking for leaks:
Seal off exhaust tail pipe. Screw off hose from air filter to air-flow sensor on air-flow sensor and seal off air-flow sensor duct. Remove hose after auxiliary-air device and blow air (0.3 bar gauge pressure) into the intake manifold with a compressed-air gun. Seal off connection port on auxiliary-air device. Open throttle valve fully while doing this. Brush or spray all joints with soapy water. Bubbling or foaming indicates a leak.

yes

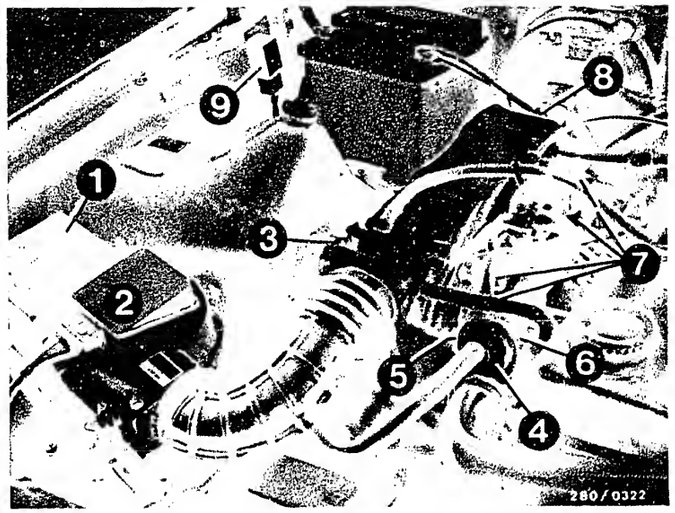
Testing completed for customer compaint "CO adjustment".

Customer complaint remedied?

no

Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates B3...B8)
  If the fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinate B3/B4).
- Engine not mechanically O.K.
  (compression, valve setting, valve timing, worn camshaft).



1=Air filter
2=Air-flow sensor
3=Throttle-valve switch
4=Auxiliary-air device
5=Thermo-time switch
6=Temperature sensor II (water)
7=Solenoid-operated injection valves
8=Start valve
9=Control relay

After-sales Service

Technical Bulletin

New Product

28
VDT-I-280/5 En
8.1981

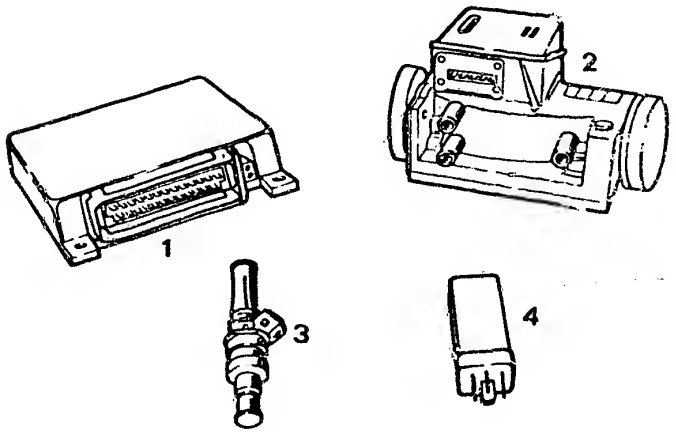
L-JETRONIC, 2nd. GENERATION

General

The familiar L-jetronic system has now been extended by the introduction of the 2nd. generation L-Jetronic. There are now 2 L-Jetronic systems on the market. This 2nd. generation system has been further developed in a number of the most important major components with the aim of reducing costs.
As regards functioning, the 2nd. generation L-jetronic differs insignificantly from its predecessor.

The following components and functions have been modified:

- Control unit
- Air-flow sensor
- Control relay
- Solenoid-operated fuel-injection valve
- Overrun cut-off (reduction in fuel consumption)



1 = 2nd. generation control unit
2 = Air-flow sensor
3 = Solenoid-operated fuel-injection valve
4 = Control relay

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Control unit

The circuitry of the control unit has been simplified. The electronic functions, though, remain unchanged.

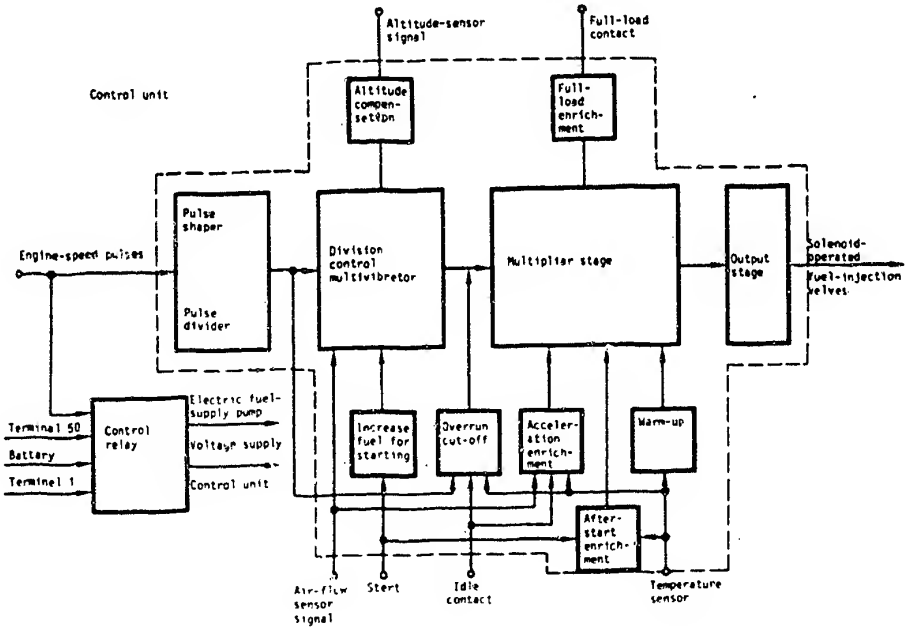
Due to the simplification measures, the circuitry is considerably more compact and this means that the casing can be slightly reduced in size and is lighter. The connection plug was also reduced to a 25-pin version.

Depending upon customer requirements, auxiliary and/or corrective functions can be incorporated in the control unit in order to adapt fully to the particular characteristics of the engine concerned.

Available functions:

- Basic control
- Overrun cut-off
- Increased fuel for starting
- Altitude compensation (input circuitry)
- After-start fuel enrichment
- Acceleration enrichment
- Full-load enrichment
- Warm-up

2nd generation L-Jetronic (block diagram)



Air-flow sensor:

The air-flow sensor has retained its shape and was only modified in the potentiometer chamber.

The pump contact has been omitted, and the air-temperature sensor (NTC 1)is now integrated within the circuitry of the air-flow sensor.

Due to these modifications, the number of terminal points was reduced from 7 to 5 (one of these terminals is the measurement point M, or E, and is reserved exclusively for alignment and calibration at the works).

Control relay:

Due to the fact that the pump contact has now been omitted from the air-flow sensor, the fuel-flooding safeguard function had to be transferred to another component. A control relay (rotational-speed relay) takes over this, as well as a number of other functions. During starting, voltage is supplied to the solenoid-operated injection valves and the electric fuel-supply pump through terminal 50 of the control unit.
When the engine has started, voltage continues to be applied only if the engine speed remains above 225 min^{-1} for 4-cylinder engines and 150 min^{-1} for 6-cylinder engines.
The relay set has been replaced by this control relay.

Solenoid-operated injection valves (yellow plug):

The control unit has a switched final stage. For this reason, the solenoid-operated injection valves are fitted with a brass solenoid winding.
Due to the former series resistors now being omitted, resistance had to be transferred to the injection valves themselves. This led to the development of a brass solenoid winding in place of the one made of copper (brass has a higher specific resistance than copper).

After-sales Service

Motor Vehicle Service Information

OPEL MANTA 2.0 E
REKORD 2.0 E

VDT-I-OPE 019 En
8.1981

LE-Jetronic

Vehicles manufactured as from 9.81

With the above mentioned types of vehicle Opel are introducing the L-Jetronic of the 2nd. generation.
The difference from the existing L-Jetronic systems is not the method of operation of the injection system, but the design of the control unit and of the injection valves.

Control unit (0 280 000 3..)

- new electronic construction
- new plug and socket, 25 pin
- new housing

Injection valves (0 280 150 2..)

- brass-wire coil with higher resistance

Testing possibility L-Jetronic II

From February 1982 a Universal tester will be available to the After-Sales Service Organization. The L-Jetronic II and other new injection systems can be tested with this tester.

Urgent cases for the After-Sales Service

If problems should arise on vehicles with L-Jetronic II during the period prior to the availability of the Universal tester, please contact KH/VKD 2.

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After-sales Service

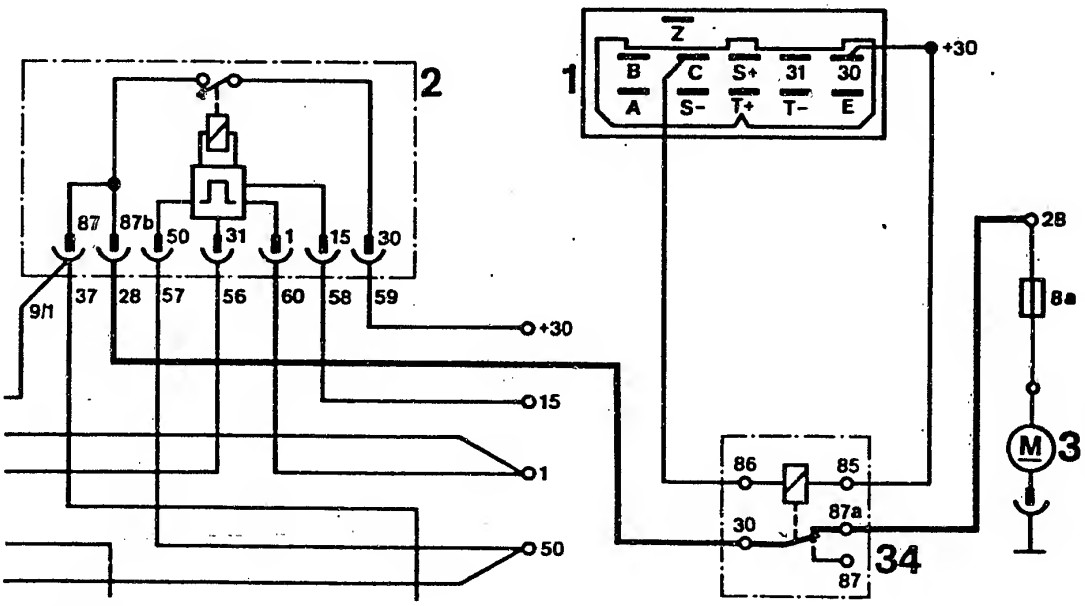
Technical Bulletin

CAR ALARM II - 0 335 411 901
in vehicles with LE-Jetronic

VDT-I-335/111.En
11.1981

If Car Alarm II (0 335 411 901) is fitted at a later stage in vehicles in which the engines are equipped with L-Jetronic of the 2nd. generation, then we recommend using the following wiring circuit as protection against theft. In this way the fuel pump is switched off when the alarm system is "primed." No fuel is therefore supplied.

Circuit diagram for L-Jetronic of the 2nd. generation



1 = Alarm relay
2 = Control relay L-Jetronic, 2nd. generation
3 = Electric fuel pump
34 = Additional relay 0 332 204 150 (formerly 0 332 204 125)

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After-sales Service

Technical Bulletin

DETERMINATION OF THE TEMPERATURE VALUES
GIVEN IN L-JETRONIC MANUALS

VDT-I-280/108 En
5.1982

We have recently been asked with increasing regularity how accurately the engine temperature must be measured when trouble-shooting on the vehicle.

So far in its L-Jetronic manuals KH/VSK has given three or four different temperatures for testing the temperature sensor:

-10 °C, +20 °C, +40 °C and +80 °C,

and two ranges for the thermo-time switch e.g. 35 °C 8 sec.

below +30 °C and above +40 °C.

Since the temperature range need not be subject to such close tolerances, we propose in future the following more appropriate definition:

- Ambient temperature (approx. +15 °C to +30 °C),
- Engine at normal operating temperature (approx. +80 °C).

Please direct questions and comments concerning the contents to our authorized representative in your country.

BOSCH Geschäftsbereich KH Kundendienst, Kfz-Ausrüstung

After-sales Service

Technical Bulletin

CODING OF LE/LH-JETRONIC
SOLENOID-OPERATED INJECTION VALVES

VDT-I-280/109 En
5.1982

With the introduction of the LE/LH-Jetronic the internal resistance of the solenoid-operated injection valves has also been changed.

Injection valve

L-Jetronic	LE/LH-Jetronic
2.5 Ω at + 20°C	16.2 Ω at + 20°C

The connector has been left the same for cost reasons and to meet customer wishes.

Caution!
If L-Jetronic injection valves are installed in an LE/LH-Jetronic vehicle, either the control unit or the injection valves will suffer irreparable damage.

Note:

- Install only injection valves with the part number designated for the vehicle.
- As a guide, injection valves with 16.2 Ω internal resistance have a yellow protective sleeve.

- A colour coding (yellow) of the connector (see also VDT-I-280/5) is not generally intended for LE/LH-Jetronic injection valves.

Please direct questions and comments concerning the contents to our authorized representative in your country.

BOSCH
Geschäftsbereich KH. Kundendienst. Kfz-Ausrüstung.

Table of Contents

When direct trouble-shooting a specific L-Jetronic component it is absolutely essential to look up the respective test step according to the customer complaint.

Automotive Equipment - After-Sales Service
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